United States Department of State
Bureau of Oceans and International
Environmental and Scientific Affairs

Draft Supplemental Environmental Impact Statement

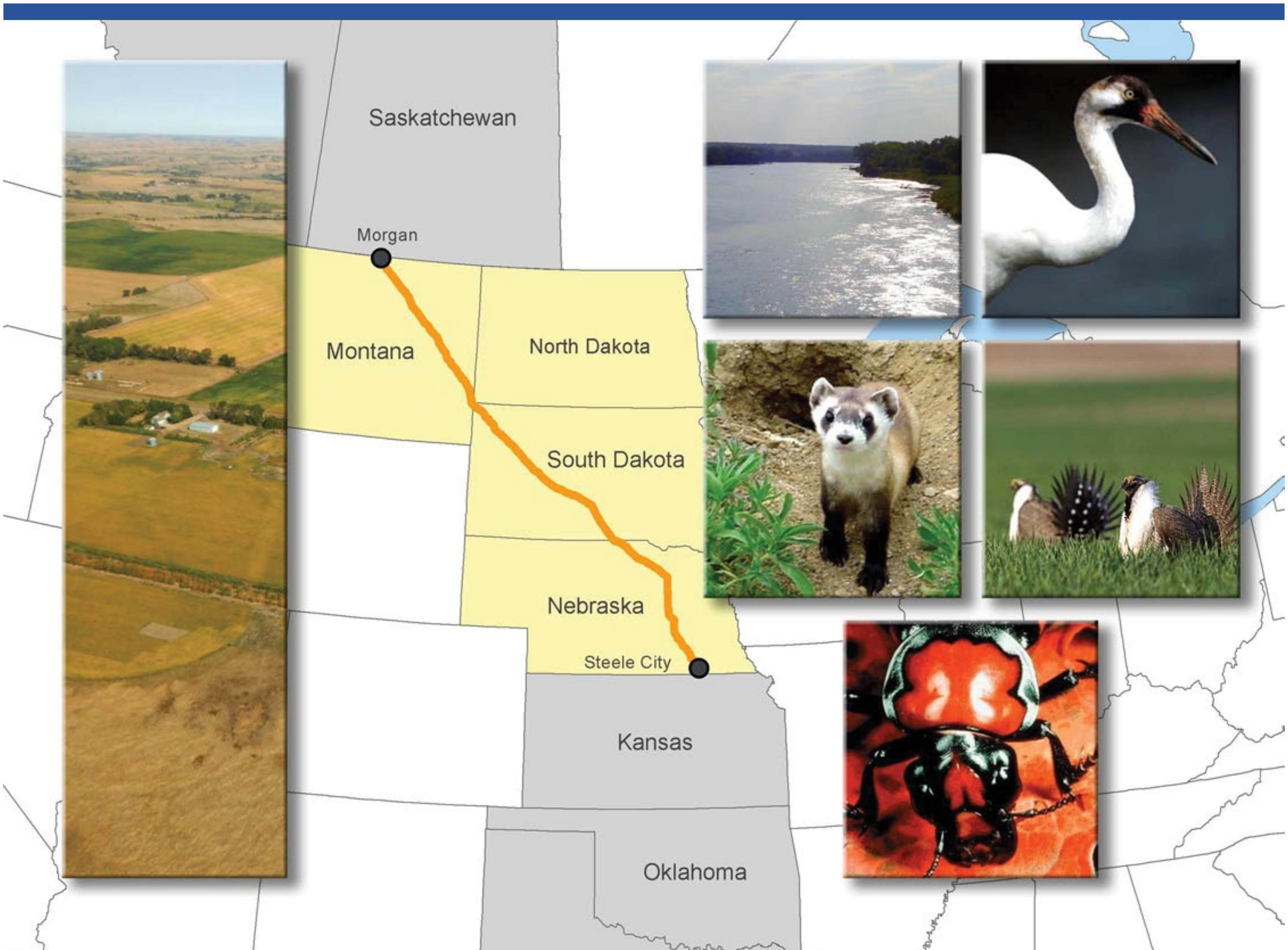
for the

Keystone XL Project

Volume IV

March 2013

Applicant for Presidential Permit: TransCanada Keystone Pipeline, LP



United States Department of State
Draft Supplemental Environmental Impact Statement

For the

KEYSTONE XL PROJECT

Applicant for Presidential Permit:
TransCanada Keystone Pipeline, LP

Volume IV

Genevieve Walker
NEPA Contact & Project Manager
United States Department of State
Bureau of Oceans and International Environmental and Scientific Affairs
2201 C Street NW, Room 2726
Washington, DC 20520

Cooperating Agencies

U.S. Army Corps of Engineers (USACE)
U.S. Department of Agriculture—Farm Service Agency (FSA)
U.S. Department of Agriculture—Natural Resource Conservation Service (NRCS)
U.S. Department of Agriculture—Rural Utilities Service (RUS)
U.S. Department of Energy (DOE)
U.S. Department of Interior—Bureau of Land Management (BLM)
U.S. Department of Interior—National Park Service (NPS)
U.S. Department of Interior—U.S. Fish and Wildlife Service (USFWS)
U.S. Department of Transportation—Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety (PHMSA)
U.S. Environmental Protection Agency (USEPA)

Assisting Agencies

U.S. Department of the Interior, Bureau of Reclamation (BOR)
Nebraska Department of Environmental Quality (NDEQ)
Various State and Local Agencies in Montana, South Dakota, Nebraska, and Kansas

March 1, 2013

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
μg/m^3	micrograms per cubic meter
/m	per meter
AA	alluvial aquifer
AAQS	Ambient Air Quality Standards
AAR	American Association of Railroads
ABMI	Alberta Biodiversity Monitoring Institute
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ACVG	alternating current voltage gradient
AEO	Annual Energy Outlook
AEUB	Alberta Energy and Utilities Board
AG	agriculture
Al-Pac FMA	Alberta-Pacific Forest Industries Forest Management Area
amsl	above mean sea level
ANSI	American National Standards Institute
AOC	abnormal operating conditions
AOPL	Association of Oil Pipelines
APE	area of potential effects
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Regions
AqL	aquatic life
ARM	Administrative Rules Montana
ARPA	Archeological Resources Protection Act
ASME	American Society of Mechanical Engineers
ATWS	additional temporary work space
AUB	Alberta Utilities Commission
AWBP	Aransas-Wood Buffalo National Park
BA	Biological Assessment
bbl	barrel
bcf	billion cubic feet
bcf/d	billion cubic feet/day
BEA	U.S. Bureau of Economic Analysis
BEPC	Basin Electric Power Cooperative
BG	block group
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BNSF	BNSF Railway Company
BOR	U.S. Bureau of Reclamation
bpd	barrels per day
BS&W	basic sediment and water
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAFE	Corporate Average Fuel Economy
CAFO	concentrated animal feeding operation
CAPP	Canadian Association of Petroleum Producers
CCPS	Center for Chemical Process Safety
CCS	Carbon capture and storage
CE	carbon equivalents
CEA	cumulative effects analysis
CEAA	Canadian Environmental Assessment Act
CEC	Commission for Environmental Cooperation
CEQ	Council on Environmental Quality

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CH_4	methane
CHAAP	Cornhusker Army Ammunition Plant
CIS	close-interval survey
CL	centerline
CL ROW	centerline of the right-of-way
cm	centimeter
CMIP	Coupled Model Intercomparison Project
CMRP	Construction, Mitigation, and Reclamation Plan
CMZ	channel mitigation zone
CN	Canadian national
CNW	commercially navigable waterway
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
co-ops	cooperatives
cP	centipoises
CP	cathodic protection
CPRS	Canadian Pacific Railway System
CRM	Control Room Management Rule
CRP	Conservation Reserve Program
CSA	Canadian Standards Association
CSS	cyclic steam stimulation
CT	census tract
CVA	Central Valley Agriculture
CWA	Clean Water Act
CY	contractor yard
dBA	decibels on the A-weighted scale
DC	direct current
DCVG	direct current voltage gradient
Department	U.S. Department of State
dilbit	diluted bitumen
DME	Dakota, Minnesota, & Eastern Railroad
DNRC	Department of Natural Resources and Conservation
DO	dissolved oxygen
DOH	Department of Health
DPHHS	Department of Public Health and Human Services
Dth/day	decatherms per day
DW	drinking water
DWT	deadweight tonnage
e-GRID	Emissions & Generation Resource Integrated Database
EC	Economic Corridor
EES	electrical equipment shelter
EI	environmental inspector
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
ESA	Endangered Species Act
ESR	Environmental Screening Report
ESRI	Environmental Systems Research Institute
EUB	Alberta Energy and Utilities Board
FBE	fusion-bonded epoxy
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Final EIS	Final Environmental Impact Statement
FIRM	*Flood insurance rate map*
FOIA	Freedom of Information Act
FPR	failure pressure ration
FR	Federal Register
FSA	Farm Service Agency
ft	feet
ft/d	feet per day
FWCA	Fish and Wildlife Coordination Act
FWP	Farmable Wetlands Program
g	gram

g/cm^3	grams per cubic centimeter
g/hp-hr	grams per horsepower-hour
g/m^2	grams per square meter
g/ml	grams per milliliter
GAP	National Gap Analysis Program
GDP	gross domestic product
GHG	greenhouse gas
GIS	Geographic Information System
GOR	Gas-oil ratio
GPA	Great Plains Aquifer
gpm	gallons per minute
GSP	gross state product
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HC	hydrocarbons
HCA	high consequence area
HDD	horizontal directional drill
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
HHV	high heating value
hp	horsepower
HPA	high population area
HPRCC	High Plains Regional Climate Center
HPSA	Health Professional Shortage Areas
hr	hour
hr/yr	hours per year
HRSA	Health Resource Services Administration
HSSM	Hydrocarbon Spill Screening Model
HVDC	high voltage direct current
IBA	important bird area
IC	Incident Commander
ICF	ICF International LLC
ICS	Incident Command System
IEA	International Energy Agency
IEO	International Energy Outlook
IHS CERA	IHS Cambridge Energy Research Associates, Inc.
IMLV	Intermediate mainline valve
in	inch
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITOPF	International Tanker Owners Pollution Federation Limited
KDWPT	Kansas Department of Wildlife, Parks, and Tourism
Keystone	TransCanada Keystone Pipeline, LP
kg	kilogram
kg/m^3	kilograms per cubic meter
km	kilometer
km^2	square kilometers
KMIGT	Kinder-Morgan Interstate Gas Transmission
kPa	kilopascal
KSDA	Kansas Department of Agriculture
kV	kilovolt
kW	kilowatt
LB	Legislative Bill
lb/MMBtu	pounds per million British Thermal Units
LCA	lifecycle analysis
LCFS	low carbon fuel standard
LCNHT	Lewis and Clark National Historic Trail
Ldn	day-night sound level
LDS	leak detection system
Leq	equivalent continuous sound level
Leq(24)	24-hour equivalent sound level
LHV	Lower heating value
LLC	limited liability company
LLS	Light Louisiana Sweet
LNAPL	light non-aqueous phase liquid
LOOP	Louisiana Offshore Oil Port
LSHR	landscape hazard ranking system
LVH	lower heating value
LW	local/county noxious week
m	meter
m/d	meter per day

m^3	cubic meter
MACT	Maximum Achievable Control Technology
MALAA	may affect, likely to adversely affect
MBCA	Migratory Bird Convention Act
MBCB	Montana Building Code Bureau
MBOGC	Montana Board of Oil and Gas Conservation
MBTA	Migratory Bird Treaty Act
MCA	Montana Code Annotated
MCL	maximum contaminant level
MCR	micro carbon residue
MDA	Montana Department of Agriculture
MDEQ	Montana Department of Environmental Quality
MDNRC	Montana Department of Natural Resources and Conservation
MDT	Montana Department of Transportation
MDU	Montana-Dakota Utilities
MFSA	Major Facilities Siting Act
MFWP	Montana Fish, Wildlife, and Parks
mg	milligrams
mg/L	milligrams per liter
mgKOH/g	milligrams potassium hydroxide per gram
MGWPCS	Montana Ground Water Pollution Control System
mi^2	square miles
MJ	megajoule
MLA	Mineral Leasing Act
MLV	mainline valve
mmbpd	million barrels per day
MMBtu	million British thermal units
MMcf/d	million cubic feet per day
MMDK	million decatherms
mmhos/cm	millimhos per centimeter
$MMTCO_2e$	million metric tons of CO_2 equivalent
MNHP	Montana Natural Heritage Program
MOP	maximum operating pressure
MP	milepost
MPDES	Montana Pollutant Discharge Elimination System
mpg	miles per gallon
MROW	Midwest Reliability Organization West
MSA	metropolitan statistical area
MSDS	Material Data Safety Sheets
MT	Montana
MUA/P	Medically Underserved Areas/Populations
MW	megawatt
MWh/yr	megawatt-hour per year
N_2O	nitrous oxide
NA	not applicable
na	not available
NAAQS	National Ambient Air Quality Standards
NAC	Nebraska Administrative Code
NACE	National Association of Corrosion Engineers
NAGPRA	Native America Graves Protection and Repatriation Act
NAIP	National Aerial Imagery Program
NAS	National Academy of Sciences
NCRC	Nebraska Central Railroad Company
ND	no data
NDA	Nebraska Department of Agriculture
NDE	nondestructive examination
NDEQ	Nebraska Department of Environmental Quality
NDGFD	North Dakota Game and Fish Department
NDHHS	Nebraska Department of Health and Human Services
NDOR	Nebraska Department of Roads
NDPA	North Dakota Pipeline Authority
NE SFM	Nebraska State Fire Marshal

NEAAQS	Nebraska Ambient Air Quality Standards
NEB	National Energy Board (Canada)
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory
NF_3	nitrogen trifluoride
NFO	Non-significant Fossil Occurrence
NGFC	Nebraska Game and Fish Commission
NGL	natural gas liquids
NGPAS	Northern Great Plains Aquifer System
NGPC	Nebraska Game and Parks Commission
NGPD	Nebraska Game and Parks Department
NHD	National Hydrography Dataset
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act of 1986
NHPAQ	Northern High Plains Aquifer
NHTSA	National Highway Traffic Safety Administration
NID	National Interest Determination
NLAA	may affect, not likely to adversely affect
NLCD	National Land Cover Database
NMHC	non-methane hydrocarbon
NNLP	Nebraska Natural Legacy Project
NNRC	Nebraska Northeastern Railway Company
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPPD	Nebraska Public Power District
NPR	National Public Radio
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRD	Natural Resources District
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NSA	noise sensitive areas
NSPS	New Source Performance Standards
NSR	New Source Review
NTSB	National Transportation Safety Board
NW	noxious weed
NWI	National Wetland Inventory
NWP	Nationwide Permit
O_2	oxygen gas
O_3	ozone
OCC	Operations Control Center
OGJ	Oil & Gas Journal
OGP	International Association of Oil and Gas Producers
OPA	other populated area
OPA 90	Oil Pollution Act of 1990
OPS	Office of Pipeline Safety
OW	open water
PA	Programmatic Agreement
PADD	Petroleum Administration for Defense District
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PCIC	project cumulative impact corridor
PEM	palustrine emergent wetland
PFC	perfluorocarbon
PFO	palustrine forested wetland
PFYC	Potential Fossil Yield Classification
PHMSA	Pipeline Hazardous Material Safety Administration
PI	point of inflection (angle)

PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameter of 10 microns and less
$PM_{2.5}$	particulate matter with aerodynamic diameter of 10 microns and less
PMMP	Paleontological Monitoring and Mitigation Plan
PMP	Pipeline Maintenance Program
POTW	publically owned treatment works
PPA	Protection Priority Areas
PPD	Public Power District
PPE	personal protective equipment
ppm	parts per million
ppmw	parts per million by weight
PPR	Prairie Pothole Region
Project	Keystone XL Project
PS	pump station
PSD	prevention of significant deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
PSRP	Pipeline Spill Response Plan
PSS	palustrine scrub shrub wetland
ptb	pounds per thousand barrels
PWS	public water supply
py	pipeyard
QC	quality control
R	riverine wetlands
R-STRENG	remaining strength
RBOB	reformulated blendstock for oxygenate blending
Rec	recreation
Reclamation	Bureau of Reclamation
REX-W	Rockies Express-West
RFI	radio frequency interference
RFS2	USEPA Renewable Fuel Standard
riv-OW	riverine-open water
ROD	Record of Decision
ROS	rest of state
ROW	right-of-way
RP	Recommended Practice
RPMA	Recovery-Priority Management Area
RPS	Renewable Portfolio Standard
RUS	Rural Utilities Service
RV	recreational vehicle
SAGD	Steam-assisted gravity drainage
SARA	Species at Risk Act
SC	species of concern
SCADA	Supervisory Control and Data Acquisition
SCC	stress corrosion cracking
SCO	synthetic crude oil
SD	South Dakota
SD DOT	South Dakota Department of Transportation
SDA	South Dakota Department of Agriculture
SDCL	South Dakota Common Law
SDDENR	South Dakota Department of Environment and Natural Resources
SDGFP	South Dakota Game, Fish, and Parks
SDIWWG	South Dakota Interagency Wetlands Working Group
SDPUC	South Dakota Public Utilities Commission
SDSMT	South Dakota School of Mines and Technology
SDWA	Safe Drinking Water Act
SER	Supplemental Environmental Report
SF_6	sulfur hexafluoride
SFL	Significant Fossil Localities
SFM	Office of the State Fire Marshall
SHPO	State Historic Preservation Office(er)
SIP	State Implementation Plan
SMS	Scenery Management System
SO_2	sulfur dioxide
SOR	Steam-oil ratio

SPCC	Spill Prevention, Control, and Countermeasure
SPSO	Southwest Power Pool South
Supplemental EIS	Supplemental Environmental Impact Statement
SWPA	Source Water Protection Area
TAN	total acid number
TBD	to be determined
TCE	trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TCP	traditional cultural properties
TDS	total dissolved solids
TEFC	The Ecological Framework of Canada
THPO	Tribal Historic Preservation Officer
TKN	total Kjehldahl nitrogen
TPG	The Perryman Group
tpy	tons per year
TSB	Transportation Safety Board
TTW	Tank-to-wheels
TWA	temporary workspace area
UP	Union Pacific Railroad Company
U.S.	United States
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	United States Global Change Research Program
USGS	U.S. Geological Survey
USNABCI	U.S. North American Bird Conservation Initiative
UST	underground storage tank
VES	variable frequency drive equipment shelter
VOC	volatile organic compound
vol%	percent volume
VRM	visual resource management
WCD	worst-case discharge
WCI	Western Climate Initiative
WCSB	Western Canadian Sedimentary Basin
WEG	Wind Erodibility Group
Western	Western Area Power Administration
WHIP	Wildlife Habitat Incentive Program
WHPA	wellhead protection areas
WHSRN	Western Hemisphere Shorebird Reserve Network
Williston Basin	A large sedimentary basin in eastern Montana, western North and South Dakota, and southern Saskatchewan known for its rich deposits of crude oil
WIPA	Western Interior Plains Aquifer
WMA	wildlife management area
WMD	Wetland Management District
WRCC	Western Regional Climate Center
WRP	Wetland Reserve Program
wt%	weight percent
WTI	West Texas Intermediate
WTR	Well-to-refinery gate
WTT	well to tank
WTW	well to wheels
WW	warmwater
WYGF	Wyoming Game and Fish Department
yr	year

-Page Intentionally Left Blank-

APPENDIX H

2012 Biological Assessment

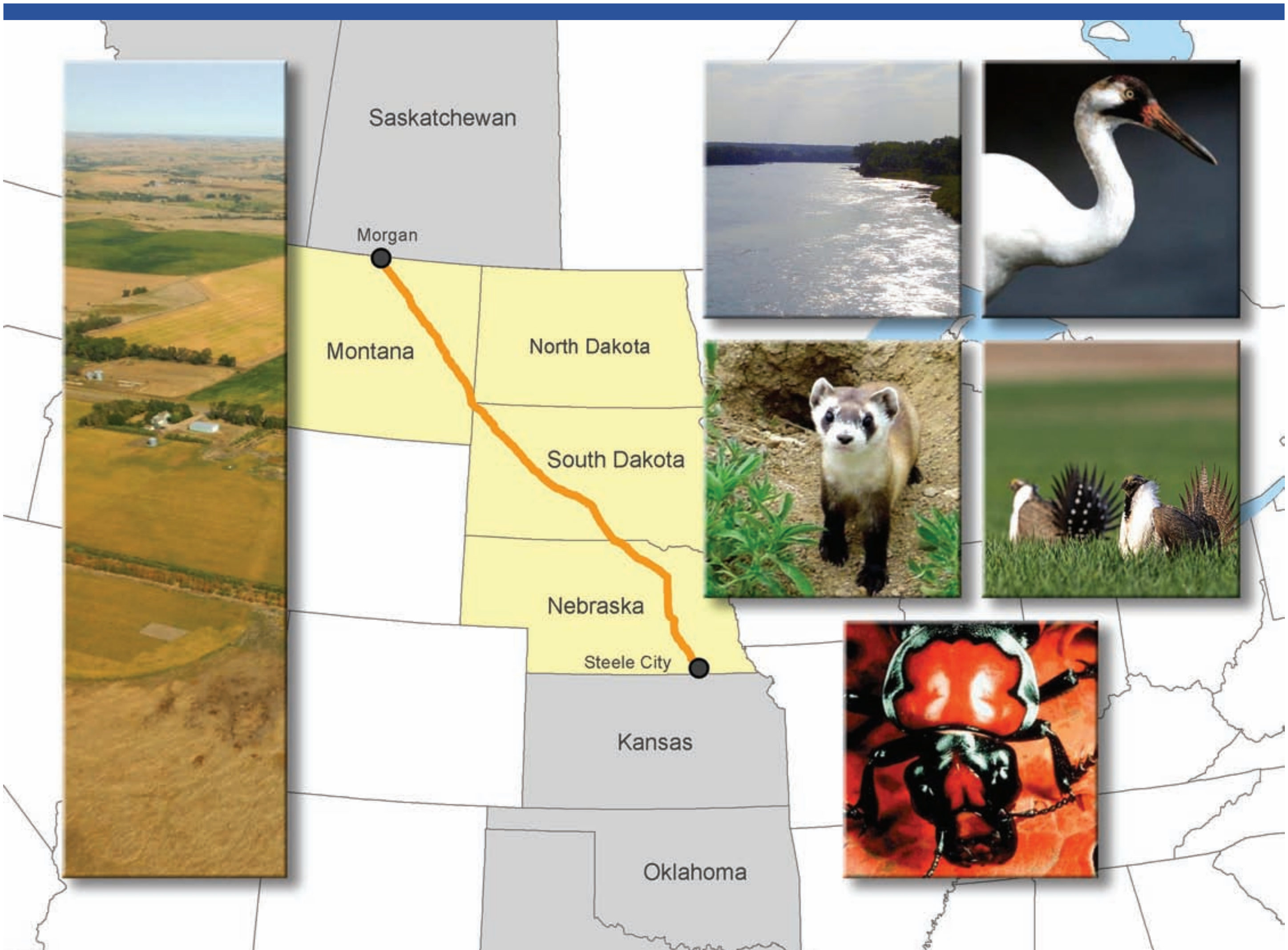
-This page intentionally left blank-

United States Department of State
Bureau of Oceans and International
Environmental and Scientific Affairs

Final Biological Assessment
for the
Keystone XL Project
Volume I

December 21, 2012

Applicant for Presidential Permit: TransCanada Keystone Pipeline, LP



-Page Intentionally Left Blank-

Prepared for:

Keystone XL Project

Keystone XL Project
Final Biological Assessment

-Page Intentionally Left Blank-

Contents

List of Appendices

List of Tables

List of Figures

Acronyms and Abbreviation

APLIC	Avian Power Line Interaction Committee
AWBP	Aransas-Wood Buffalo National Park
BA	Biological Assessment
bcf/ day	billion cubic feet per day
BLM	Bureau of Land Management
BMP	best management practice
bpd	barrels per day
CAFOs	concentrated animal feeding operations
CEA	cumulative effects analysis
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CL ROW	centerline of the right-of-way
CMRP	Construction, Mitigation, and Reclamation Plan
CVA	Central Valley Agriculture
CWS	Canadian Wildlife Service
Department	U.S. Department of State
DOH	Department of Health
DPHHS	Department of Public Health and Human Services
Dth/ day	decatherms per day
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Emergency Response Plan
ESA	Endangered Species Act
FR	Federal Register
GIS	geographical information system
HDD	horizontal directional drill
IBA	important bird area
Keystone	TransCanada Keystone Pipeline, LP
km	kilometer
KMIGT	Kinder-Morgan Interstate Gas Transmission
kV	kilovolt

LA	local area
MALAA	may affect, likely to adversely affect
MBCB	Montana Building Code Bureau
MBTA	U.S. Migratory Bird Treaty Act
MDEQ	Montana Department of Environmental Quality
MDT	Montana Department of Transportation
MDU	Montana-Dakota Utilities
MFWP	Montana Fish, Wildlife, and Parks
MLV	main line valve
MMcf/d	million cubic feet per day
MOP	maximum operating pressure
MP	milepost
MVA	million volt-amperes
MW	megawatt
NA	not applicable
NCRC	Nebraska Central Railroad Company
NNRC	Nebraska Northeastern Railway Company
NDEQ	Nebraska Department of Environmental Quality
NDHHS	Nebraska Department of Health and Human Services
NEPA	National Environmental Policy Act
NE SFM	Nebraska State Fire Marshal
NGPC	Nebraska Game and Parks Commission
NLAA	may affect, not likely to adversely affect
NMFS	National Marine Fisheries Service
NPPD	Nebraska Public Power District
NRC	National Response Center
NRCS	Natural Resources Conservation Service
OCC	Operations Control Center
OPS	Office of Pipeline Safety
PA	project area
PCIC	project cumulative impact corridor
PHMSA	Pipeline Hazardous Material Safety Administration
PPD	Public Power District

PPH	Preliminary Priority Habitat
Project	Keystone XL Pipeline Project
PS	pump station
PSRP	Pipeline Spill Response Plan
R	Regional
REX-W	Rockies Express-West
ROW	right-of-way
RPMA	Recovery-Priority Management Area
SCADA	Supervisory Control and Data Acquisition
SDDENR	South Dakota Department of Environment and Natural Resources
SD DOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish, and Parks
SPCC	Spill Prevention, Control, and Countermeasure
TBD	to be determined
TWA	temporary work area
U.S.	United States
USC	U.S. Code
UP	Union Pacific Railroad Company
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

-Page Intentionally Left Blank-

1.0 INTRODUCTION

1.1 SECTION 7 ESA PROCESS

The United States Department of State (Department) is the lead federal agency for the initial evaluation of anticipated impacts of TransCanada Keystone Pipeline, LP's (Keystone) proposed Keystone XL Pipeline Project (Project) on federally protected and candidate species and federally designated critical habitat. Federal agencies, in consultation with the United States Fish and Wildlife Service (USFWS), are required to ensure that any action they authorize, fund, or carry out does not result in the jeopardy to federally protected and candidate species or result in the destruction or adverse modification to federal designated critical habitat.

When a proposed federal action may affect a federally protected species, Section 7(c) of the Endangered Species Act (ESA) requires consultation with the USFWS, and a Biological Assessment (BA) is required if protected species or their critical habitat may be present in the area affected by any aspect of the proposed Project. An in-depth review was performed for the proposed Project components (i.e., Project centerline right-of-way [ROW] and aboveground facilities). A preliminary analysis of connected actions, such as transmission lines, was also conducted.

1.2 CONSULTATION HISTORY

Construction and operation of the proposed Project may affect habitats and populations of species protected under the federal ESA and by individual state legislation. In 2008, the Department appointed Keystone and its subcontractors to act as its designated non-federal representatives for Section 7 ESA consultation with respect to Keystone's Presidential Permit application for the previous proposed Keystone XL Project. In April 2008, Keystone, on behalf of the Department, initiated consultation with the USFWS, Bureau of Land Management (BLM), and state agencies to identify species and habitats of concern. No National Marine Fisheries Service (NMFS) listed species were determined to be within the proposed Project area. After meeting with USFWS, BLM, and state agencies, lists of species and habitats potentially affected by the proposed Project were compiled for further analysis. Keystone developed field survey protocols, identified targeted survey areas, and developed survey schedules using this information.

Keystone submitted these survey protocols, target areas, and schedules to the appropriate agencies for review and comment in spring 2008. Agency review and approval of survey protocols began in 2008. Keystone filed documentation of agency correspondence associated with the review and approval process with the Department in November 2008, July 2009, June 2010, and November 2010. The Department completed a 2011 BA for the previous proposed Project.

In September of 2011, the USFWS released a Biological Opinion with an incidental take statement for the American burying beetle in South Dakota, Nebraska, and Oklahoma. Subsequently, the USFWS withdrew the Biological Opinion at the Department's request based on Keystone's agreement with Nebraska to reroute the pipeline in Nebraska to avoid the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region. Keystone has since filed a new Presidential Permit application with the Department (May 2012). In June

2012, the Department initiated Section 7 ESA consultation for the May 2012 Keystone XL Pipeline Presidential Permit application. Keystone submitted an applicant-prepared draft BA for the proposed Project in September 2012. For the new application, the Department did not designate Keystone as the non-federal representative. Keystone did not include the Gulf Coast portion of the previous Keystone XL project in its May 2012 application. Keystone decided to pursue the Gulf Coast Project as a stand-alone project with independent utility. That project received the necessary permits from relevant federal and state agencies and is under construction. The proposed Project encompasses the former "Steele City" segment of the previous proposed Project and is the subject of this BA.

The Project through Montana and South Dakota is essentially the same as that reviewed and assessed in the previous 2011 BA and 2011 Biological Opinion for the previous proposed Project. Keystone will also use a 60-acre pipe yard in North Dakota. This 2012 BA covers federally protected and candidate species and updated proposed Project information.

Biological field surveys within the proposed Keystone XL Project footprint (e.g., pipeline ROW, pump stations, access roads, pipe yards, contractor yards, extra workspace, etc.) were initiated in spring 2008. These surveys were conducted along the centerline and filed with the Department in November 2008. Additional surveys along the ROW have continued every year through the summer of 2012, to take account of route alignment modifications, additional survey access permissions granted by private landowners, and additional agency requests for surveys. If necessary, additional species-specific field surveys will be conducted prior to proposed Project construction, in coordination with the appropriate agencies.

The following list provides a summary of Keystone's agency correspondence, species-specific survey information, and continued consultation with the USFWS since 2008 regarding coordination of biological surveys and determination of biological impacts for the proposed Project. This summary lists consultation relevant to Montana, South Dakota, and Nebraska:

- <u>April 2008, Multiple Agencies</u>: Keystone sent initial consultation letters to the appropriate Montana, South Dakota, and Nebraska USFWS, BLM, and state wildlife agency offices, as well as state natural heritage programs to request their input on identifying prominent terrestrial and aquatic resource issues or concerns that may occur within or adjacent to the ROW, focusing on species that are either sensitive (e.g., federally listed); have high economic value (e.g., big game, waterfowl); or are considered important resources (e.g., raptors, fish). The consultation letters included state-specific special status species tables compiled from data received from each state, USFWS, and BLM with brief descriptions of species habitat, miles of potential habitat crossed by the Project, and approximate mileposts where potential habitat was identified along the ROW.
- <u>May 5, 2008, USFWS/Nebraska Game and Parks Commission (NGPC)</u>: Keystone held an agency meeting at the NGPC office in Lincoln, Nebraska, to discuss issues pertaining to wildlife, special status species, and sensitive habitat that could potentially occur in the Project area. Attendees included representatives from USFWS and NGPC. The goal was to gather input on agency recommendations based on the information sent to them in April 2008 for species occurrence, habitat assessments, and future field surveys. Keystone incorporated comments from the meeting into survey protocol and best management practices (BMPs) documents for future agency verification.

- May 8, 2008, USFWS/Montana Fish, Wildlife, and Parks (MFWP): Keystone held an agency meeting at the MFWP office in Helena, Montana, to discuss issues pertaining to wildlife, special status species, and sensitive habitat that could potentially occur in the Project area. Attendees included representatives from USFWS and MFWP. The goal was to gather input on agency recommendations based on the information sent to them in April 2008 for species occurrence, habitat assessments, and future field surveys. Keystone incorporated comments from the meeting into survey protocol and BMP documents for future agency verification. MFWP requested a follow-up meeting with additional technical staff from MFWP (Regions 6 and 7).
- June 10, 2008, USFWS/South Dakota Department of Game, Fish, and Parks (SDGFP): Keystone held an agency meeting with staff from USFWS and SDGFP at the SDGFP office in Pierre, South Dakota, to discuss issues pertaining to wildlife, special status species, and sensitive habitat that could potentially occur in the Project area. The goal was to gather input on agency recommendations based on the information sent to them in April 2008 for species occurrence, habitat assessments, and future field surveys. Keystone incorporated comments from the meeting into survey protocol and BMP documents for future agency verification.
- July 29, 2008, MFWP/BLM: Keystone held an agency meeting with staff from the BLM Glasgow Field Office and MFWP Regions 6 and 7 at the MFWP office in Glasgow, Montana, to discuss issues pertaining to wildlife, special status species, and sensitive habitat that could potentially occur in the Project area. The goal was to gather input on agency recommendations based on the information sent to them in April 2008 for species occurrence, habitat assessments, and future field surveys. Keystone incorporated comments from the meeting into survey protocol and BMP documents for future agency verification.
- January/February 2009, Multiple Agencies: Keystone sent a consultation package to the applicable USFWS, BLM, and state wildlife agency offices for Montana, South Dakota, and Nebraska that included state-specific special status species survey protocol and BMP documents for the species identified as potentially occurring during the 2008 meetings. A summary of the findings from the 2008 biological field surveys was included in the discussions.
- January 27, 2009, USFWS/SDGFP: Keystone held an agency meeting with staff from USFWS and SDGFP at the SDGFP office in Pierre, South Dakota, to discuss issues pertaining to special status species surveys. The goal of this meeting was to verify Keystone's survey approach, BMPs, discuss required field surveys, and review the information that was sent to the USFWS in the January/ February 2009 consultation package. The USFWS and SDGFP provided additional recommendations to Keystone's sensitive species mitigation approach to be updated prior to final agency concurrence.
- February 3, 2009, BLM/MFWP: Keystone held an agency meeting with staff from the BLM Glasgow Field Office and MFWP Regions 6 and 7 at the MFWP office in Glasgow, Montana, to discuss issues pertaining to special status species surveys. The goal of this meeting was to verify Keystone's survey approach and BMPs, discuss required field surveys, and review the information sent to the USFWS in the January/February 2009 consultation package. The BLM and MFWP provided additional recommendations to Keystone's sensitive species mitigation approach to be updated prior to final agency concurrence.

- February 5, 2009, BLM: Keystone held a conference call in lieu of an agency meeting with staff from the BLM Glasgow, Malta, and Miles City field offices to discuss issues pertaining to special status species surveys. The goal of this meeting was to verify Keystone's survey approach and BMPs, discuss required field surveys, and review the information sent to the USFWS in the January/February 2009 consultation package. The BLM provided additional recommendations to Keystone's sensitive species mitigation approach to be updated prior to final agency concurrence.
- February 19, 2009, USFWS/NGPC: Keystone held an agency meeting with staff from USFWS and NGPC at the NGPC office in Lincoln, Nebraska, to discuss issues pertaining to special status species surveys. The goal of this meeting was to verify Keystone's survey approach and BMPs, discuss required field surveys, and review the information sent to the USFWS in the January/February 2009 consultation package. The USFWS and NGPC provided additional recommendations to Keystone's sensitive species mitigation approach to be updated prior to final agency concurrence.
- June 25, 2009, USFWS, Pierre, South Dakota Ecological Services Field Office: Keystone called C. Bessken, USFWS Pierre, South Dakota, Field Office regarding geotech activity clearance. The USFWS requested formal consultation with the Department to address take of the American burying beetle in South Dakota.
- March 2, 2010, USFWS: Keystone held a conference call with USFWS on threatened and endangered and United States Migratory Bird Treaty Act (MBTA) Surveys. The goal of the call was to discuss helicopter survey windows for raptors/rookeries and bald eagles in 2010. The need for conducting additional pedestrian surveys for piping plovers was also discussed.
- September 3, 2010, Multiple Agencies: A meeting was held between USFWS, Keystone, the Department, and Cardno ENTRIX regarding the Section 7 ESA formal consultation for the Keystone XL Pipeline Project.
- September 9, 2010, Multiple Agencies: A meeting was held between USFWS, BLM, and Keystone regarding mitigation and construction stipulations for greater sage-grouse.
- October 12, 2010, Multiple Agencies: Meetings continued between USFWS, Keystone, NGPC, and Cardno ENTRIX regarding the Keystone XL Pipeline Project's Section 7 ESA formal consultation on the American burying beetle.
- January 7, 2011, Multiple Agencies: A meeting was held between USFWS, Keystone, and Cardno ENTRIX to discuss USFWS comments on the preliminary 2011 Biological Assessment.
- January 12, 2011, Multiple Agencies: Meetings continued between USFWS, Keystone, NGPC, and Cardno ENTRIX regarding the Keystone XL Pipeline Project's Section 7 formal consultation on the American burying beetle.
- February 2, 2011, Multiple Agencies: Meetings continued between USFWS, Keystone, the Department, and Cardno ENTRIX regarding the Keystone XL Pipeline Project's Section 7 ESA formal consultation on the American burying beetle.
- February 17, 2011, USFWS and the Department: A meeting was held between USFWS, the Department, and Cardno ENTRIX regarding the Keystone XL Pipeline Project's Section 7 ESA formal consultation on the American burying beetle.

- March 24, 2011, USFWS, Keystone, the Department, NGPC: Meetings continued between USFWS, NGPC, Keystone XL, and the Department regarding the Keystone XL Pipeline Project's Section 7 ESA formal consultation on the American burying beetle.
- April 21, 2011, Keystone and the Department: Meetings continued regarding the Keystone XL Pipeline Project's Section 7 ESA formal consultation on the American burying beetle.
- April 27, 2011, USFWS and the Department: Meetings continued regarding the Keystone XL Pipeline Project's Section 7 ESA Formal Consultation on the American burying beetle. USFWS and the Department discussed monitoring and habitat restoration bonding.
- May 19, 2011: The Department submitted the 2011 BA to the USFWS with a letter requesting initiation of formal consultation.
- August 26, 2011: The Department issued the Final Environmental Impact Statement (Final EIS) to cooperating agencies and the public.
- September 6, 2011: USFWS issued their 2011 Biological Opinion on the Effects to Threatened and Endangered Species from the Construction and Operation of the Proposed Keystone XL Pipeline.
- December 20, 2011: The Department requested that the USFWS withdraw their 2011 Biological Opinion for the proposed Keystone XL Project.
- December 21, 2011: The USFWS withdrew their 2011 Biological Opinion for the proposed Keystone XL Project.
- June 27, 2012, USFWS, the Department, BLM, Montana Department of Environmental Quality (MDEQ), MFWP: Discussion between USFWS, the Department, BLM, MDEQ, MFWP on the proposed Keystone XL Project to discuss project status and schedule.
- July 6, 2012, USFWS, the Department, BLM: Meetings continued regarding the Section 7 ESA consultation for the proposed Project application.
- August 28, 2012: The Department submitted a species list of federally protected and candidate species and federally designated critical habitat to USFWS for the proposed Project and requested that USFWS verify that list and information pertaining to federally protected and candidate species and federally designated critical habitat.
- September 7, 2012: Keystone submitted the TransCanada Keystone XL Pipeline Project Environmental Report to the Department with an applicant-prepared Draft BA.
- September 28, 2012: USFWS submitted a Technical Assistance letter for the proposed Project with a list of species that may occur in the proposed Project area.
- October 9, 2012, USFWS, the Department, Keystone, BLM, NGPC, NDEQ, MFWP: A meeting was held between USFWS, the Department, Keystone, BLM, NGPC, NDEQ and MFWP regarding the proposed Project's Section 7 ESA consultation including the American burying beetle.
- October 10, 2012, USFWS, Department, Keystone, BLM, NGPC, NDEQ, MFWP: Meetings continued between USFWS, the Department, Keystone, BLM, NGPC, NDEQ, and MFWP regarding the proposed Project's Section 7 ESA consultation including the American burying

beetle, and on state-protected species, the draft BA, species surveys, avoidance, minimization, and compensation measures.

- October 23, 2012, USFWS, Department, SDGFP, BLM, Keystone: Meeting between USFWS, the Department, SDGFP, BLM, and Keystone regarding the greater sage–grouse and a compensatory mitigation plan for the species in South Dakota.

Supporting meeting summaries, consultation letters, and communications are located in the 2011 Final EIS. Based on the consultation with state agencies, BLM, and the USFWS from 2008 to 2012, Keystone was able to refine the proposed biological surveys and survey requirements and avoidance, minimization, and compensation strategies for each species that may potentially be affected by the proposed Project. That information is presented in this BA.

1.3 ANALYSIS SUMMARY

This analysis addresses 13 federally protected or candidate species that were identified by the Department, the USFWS and state wildlife agencies as potentially occurring in the proposed Project area. On August 28, 2012, the Department submitted a species list of federally protected and candidate species and federally designated critical habitat to USFWS for the proposed Project area. Table 1.3-1 summarizes these species and the preliminary impact determinations based on: 1) correspondence with the USFWS, BLM, and state wildlife agencies; 2) habitat requirements and the known distribution of these species within the proposed Project area; and 3) habitat analyses and field surveys that were conducted for these species from 2008 through 2012. Potential impacts associated with electrical infrastructure required for the proposed Project are based on the 2008 through 2012 biological surveys where available.

Table 1.3-1 Summary of Species Included in Analysis and Findings

Common Name	Scientific Name	Federal Status	Detailed Analysis Included	Findings Summary[1, 2]
Mammals				
Black-footed ferret	*Mustela nigripes*	Endangered/Experimental Populations	Yes	NLAA/NLAA
Gray wolf	*Canis lupus*	Endangered/ Experimental Populations	No	No Effect/ No Effect
Birds				
Eskimo curlew	*Numenius borealis*	Endangered	No	No Effect
Greater sage-grouse	*Centrocercus urophasianus*	Candidate	Yes	NLAA
Interior least tern	*Sternula antillarum*	Endangered	Yes	NLAA
Piping plover	*Charadrius melodus*	Threatened	Yes	NLAA
Sprague's pipit	*Anthus spragueii*	Candidate	Yes	NLAA

Common Name	Scientific Name	Federal Status	Detailed Analysis Included	Findings Summary[1, 2]
Whooping crane	*Grus americana*	Endangered	Yes	NLAA
Fish				
Pallid sturgeon	*Scaphirhynchus albus*	Endangered	Yes	NLAA
Topeka shiner	*Notropis topeka*	Endangered	No	No Effect
Invertebrates				
American burying beetle	*Nicrophorus americanus*	Endangered	Yes	MALAA
Plants				
Blowout penstemon	*Penstemon haydenii*	Endangered	No	No Effect
Western prairie fringed orchid	*Platanthera praeclara*	Threatened	Yes	NLAA

[1] NLAA – May affect, not likely to adversely affect.

[2] MALAA – May affect, likely to adversely affect.

1.3.1 Connected Actions

The proposed Project would also include several connected actions including: (1) the Bakken Marketlink Project; (2) the Big Bend to Witten 230-kV Transmission Line; and (3) Electrical Distribution Lines and Substations. These connected actions are described briefly here.

1.3.1.1 Bakken Marketlink Project

Construction and operation of the Bakken Marketlink Project would include metering systems, a five-mile pipeline segment (route not yet determined), three new storage tanks near Baker, Montana. The known distribution of the greater sage-grouse and interior least tern would not overlap with pipelines or storage tanks proposed under this connected action. In addition, the Bakken Marketlink facilities near Baker would not likely affect the whooping crane as this region is not within the whooping crane migration corridor. However, the Bakken Marketlink facilities would be constructed in a region used by Sprague's pipit. Additional federally protected or candidate species may occur within the area where Bakken Marketlink Project activities would occur.

1.3.1.2 Big Bend to Witten 240-kV Transmission Line

The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid to support power requirements for pump stations in South Dakota. Federally protected and candidate species may occur where the transmission lines and associated poles/towers would be constructed.

1.3.1.3 Electrical Distribution Lines and Substations

The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities.

The Rural Utilities Service (an agency within the United States Department of Agriculture) and the Western Area Power Administration (an agency of the United States Department of Energy) would consult with USFWS when a proposed federal project may affect a federally protected (listed) species and/or federally designated critical habitat. Such circumstances routinely occur during the course of planning for routing and construction procedures for electrical power lines. Although power providers are dealing directly with USFWS on threatened and endangered species issues and consulting with the USFWS regarding ways to minimize or mitigate impacts to threatened and endangered species affected by construction and new distribution lines to the pump stations, potential impacts and conservation measures for distribution lines are presented within this 2012 BA. Agreements received from power providers concerning their intent to consult with USFWS are included in Appendix A (Letters of Section 7 Consultation Commitments from Power Providers).

Electrical power for the proposed Project would be obtained from local power providers. These power providers would construct the necessary substations and transformers and would either use existing service lines or construct new service lines to deliver electrical power to the specified point of use. The electrical power providers would be responsible for obtaining the necessary permits, approvals, or authorizations from federal, state, and local governments.

Most of the proposed new electrical distribution lines to service pump stations would be 115-kV lines strung on a single-pole and/or H-frame wood poles. The poles would typically be about 60 to 80 feet high with wire span distances of about 250 to 400 feet. Communication towers at pump stations would generally be approximately 33 feet in height. However, antenna height at select pump stations, as determined upon completion of a detailed engineering study, may be taller, but in no event would exceed a maximum height of 190 feet. Communication towers would be constructed without guy wires. The pipe entering and exiting the pump station sites would be located below grade. The pipe manifolding connected with the pump stations would be above ground.

The spill risk to a species is based upon the length of pipeline crossing its migration habitat/habitat and the spill risk incident rate as described in Section 4.14 of the draft Supplemental Environmental Impact Statement. For example, based upon a 119 mile pipeline segment that passes through native grass prairie for the Sprague pipits' habitat and an incident spill risk of 0.00025 incident/ mile-year, the estimated spill risk occurrence within the habitat is 34 years or 0.030 incidences per year. For other species along the Proposed route, the distance of a species habitat crossed by the Proposed project route is less than that crossed for the Spraque pipits' habitat; therefore, the spill risk occurrence for these other species is lower than the 0.030 incidents per year (i.e., more than 34 years before an incident occurs).

Spill volume cannot be predicted for any species mitigation habitat/habitat; however, because 80% of historical spill volumes are less than 50 barrels (bbls), the probable spill volume could be less than 50 bbls which could result in a radial impact from the pipeline of up to 112 feet (34.1 meters)(U.S. Department of State 2012).

1.4 SUMMARY OF SPECIES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Four federally protected or candidate species initially identified as potentially occurring within the proposed Project area were evaluated during consultation, but were eliminated from detailed analysis based on further review of the location of the proposed Project relative to known species distributions, habitat important to the species, or additional information provided by federal or state agencies.

1.4.1 Gray Wolf - Endangered/Experimental Populations

The gray wolf (*Canis lupus*) was once found throughout much of the continental United States. Gray wolves are currently listed as Endangered in South Dakota and Nebraska, and were delisted in Montana in May 2011. One gray wolf was killed in Spalding, Nebraska, in 2002 and was determined to be a dispersing male from Minnesota (USFWS 2003). Prior to 2002, a wolf had not been sighted in Nebraska since 1913 (USFWS 2003). There are no known populations of gray wolves in South Dakota (USFWS 2012a). Some wolves that disperse from Yellowstone National Park have occasionally been found in western South Dakota, but sightings are infrequent, with only three wolves recorded in recent years (The Wildlife News 2012). Since there are no populations of gray wolves in South Dakota or Nebraska, and since the species is no longer listed in Montana, the gray wolf was eliminated from detailed analysis.

1.4.2 Eskimo Curlew - Endangered

The endangered Eskimo curlew (*Numenius borealis*) historically migrated through the proposed Project area in Nebraska. The Eskimo curlew was reliant on wet meadow and grassland habitats in the Great Plains as it migrated between its breeding and overwintering habitats in Alaska and South America, respectively. Habitat loss, widespread overhunting, and loss of food resources led to the decline and eventual loss of this species. It is now thought to be extinct. Swenk reports in 1926, "The last report for Nebraska was on April 8, 1926. A flock of eight birds was seen 6 kilometers (km) (4 miles) east of Hastings. (Swenk 1926:117)" (Gollop et al. 1986). Correspondence from the Nebraska USFWS and NGPC has determined that this species would not be impacted by the proposed Project (AECOM 2009a, USFWS 2012b). The species has not been confirmed in Nebraska since 1926 and in South Dakota since 1963. The species does not occur in Montana. It is unlikely that the proposed Project would have an adverse effect on the Eskimo curlew given the paucity of confirmed sightings of the species and the lack of suitable habitat along the proposed Project route. Because the Eskimo curlew has not been found in Nebraska since 1926 and in South Dakota since 1963, the proposed Project is not expected to impact this species and was eliminated from further analysis.

1.4.3 Topeka Shiner - Endangered

The federally endangered Topeka shiner (*Notropis topeka*) inhabits cool, clear, spring-fed streams with well-developed riparian corridors. It occurs in South Dakota in the James, Vermillion, and Big Sioux rivers watersheds, and in Nebraska in the Taylor, Big Slough, and Brushy creek watersheds. The Topeka shiner also occurs in Butler County, Kansas (USFWS 2008a). One pump station proposed for Butler County, Kansas is located within an agricultural field and suitable habitat does not exist for the Topeka shiner in or near this location. The proposed Project does not cross any streams where Topeka shiners have been found, based on extensive survey work conducted for this and other native fish species. Thus, the proposed Project is not expected to impact this species and was eliminated from further analysis.

1.4.4 Blowout Penstemon - Endangered

The blowout penstemon (*Penstemon haydenii*) is a federally listed endangered plant and is state-listed in Nebraska as endangered. Blowout penstemons are found in the Sandhills of north-central Nebraska. Currently, 32 blowout penstemon populations (10 native population sites and 22 introduced population sites) occur in the Sandhills of Nebraska (Stubbendieck 2008) including plantings in Rock County, Nebraska. Blowout penstemon is a federally endangered plant found in blowouts in Nebraska and Wyoming sandhill habitat. The plant can be found in early successional blowout habitat where it has little competition for scarce water and nutrients from other plants. However, as blowout habitats mature and become stabilized, other plants will become established, and the blowout penstemon disappears. Stabilization of blowouts and other disturbances that result in the physical loss of these habitats can have an adverse effect on the blowout penstemon.

The northern portion of the proposed Project in Nebraska is being rerouted to the east to avoid the Sandhills of Nebraska. Further, the blowout penstemon is not likely to occur within the proposed Project area in Rock County, Nebraska, as the known occurrences are well west of the proposed area. Pedestrian botanical surveys of the proposed Project in 2012 also did not locate any suitable habitat for the species. Presence/absence surveys were not recommended for this plant because no construction or related activities and impacts would occur in blowout penstemon habitat; therefore the blowout penstemon was eliminated from detailed analysis in this BA. It is unlikely that the proposed Project will have an effect on the blowout penstemon because of the lack of suitable habitat for the species along the proposed Project route.

2.0 PROPOSED ACTION

2.1 PROPOSED ACTION BACKGROUND

Keystone has applied to the Department for a Presidential Permit for the construction, connection, operation, and maintenance of the proposed Project pipeline and associated facilities at the border of the United States for importation of crude oil from Canada. The Department receives and considers such applications for Presidential Permits for facilities to transport petroleum, petroleum products, coal, and other fuels transmission projects pursuant to the President's constitutional authority, which authority the President has delegated to the Department in Executive Order (EO) 13337, as amended (69 Federal Register [FR] 25299). Under EO 13337, the Secretary of State may issue a Presidential Permit for a border crossing facility if she finds that issuing such a permit would be in the "national interest." EO 13337 also specifies a process for the Department to seek the views from certain other agencies on whether issuing a permit would be in the national interest. It was determined in consultation with other agencies (including BLM and the United States Army Corps of Engineers [USACE]) that the Department would act as the lead federal agency for the environmental review of the proposed Project consistent with National Environmental Policy Act (NEPA). Consequently, the Department is also the lead agency consulting with the USFWS consistent with Section 7 of the ESA.

Several federal agencies are cooperating agencies with the Department, and involved in some capacity with the proposed Project. The proposed Project would affect numerous rivers and wetlands, thus the USACE would issue Section 404 permits as necessary. Because the proposed Project would cross both public and private lands, the BLM would evaluate the proposed Project and decide whether to grant Keystone an ROW across those federal lands pursuant to ROWs under the Mineral Leasing Act (43 Code of Federal Regulations [CFR] 2880). These federal lands principally include 43 miles of pipeline ROW in Montana, but the proposed pipeline would also cross or go under Bureau of Reclamation facilities on federal land in Montana and on private land in South Dakota. The Western Area Power Administration would own a small section of a 230-kV transmission line in southern South Dakota. This line would supply upgraded load capacity and support voltage requirements for pump stations 20 and 21 (in Tripp County, South Dakota) in the future if the proposed pipeline were to operate at full capacity sometime in the future. Finally, the Rural Utilities Service of the Department of Agriculture would provide grants to help fund construction of some of the power distribution lines that may be built to provide power to the proposed pipeline pump stations.

Keystone proposes to construct and operate a crude oil transmission system from an oil supply hub near Hardisty, Alberta, Canada, to destinations in the United States. The proposed Project would have the nominal capacity to deliver up to 830,000 barrels per day of crude oil. Detailed Project information is provided in the Supplemental EIS issued by the Department. For the previous proposed Project application (see Final EIS August 2011), updates to tables and text are provided below where changes have occurred for the proposed Project.

In general, there have been 64 route modifications made in Montana, 51 route modifications in South Dakota, and 16 route changes in Nebraska since the Final EIS was issued, to accommodate landowner concerns and the results of engineering and environmental surveys, and to comply with state permitting requirements (route modifications and changes can be found in Section 1, pages 16 through 25, of the September 7, 2012, TransCanada Keystone XL Pipeline Project Environmental Report) (exp Energy Services Inc. 2012). Of these, only 2 in Montana are outside the previous survey corridor, 29 in South Dakota are outside the survey corridor, and the 11 route changes in Nebraska are outside the survey corridor. The route changes in Nebraska result from Keystone's agreement to reroute the pipeline around the NDEQ-identified Sand Hills Region. No changes have been made to the two pump station locations in Kansas from the 2011 Final EIS. Within North Dakota, the proposed Project includes an ancillary facility that will be used as a rail siding and pipe storage location. The North Dakota 60-acre pipe yard was used previously as part of TransCanada Pipelines Limited's Bison Pipeline Project. An overview map of the Project location is provided in Figure 2.1.5-1. Figures 2.1.5-2 through 2.1.5-6 show the more detailed pipeline route and aboveground facility locations for Montana, North Dakota, South Dakota, Nebraska, and Kansas. Pipeline aerial photo and United States Geologic Survey (USGS) topographic map route sheets for the currently proposed Project, power line routes, and site-specific river horizontal directional drilling (HDD) crossing plans are part of the September 7, 2012 TransCanada Keystone XL Pipeline Project Environmental Report, in connection with the Department review of Keystone's pending Presidential Permit application (see Appendix J of the September 7, 2012 Environmental Report) (exp Energy Services Inc. 2012).

2.1.1 Project Description and Location

From north to south, the proposed Project extends from the United States/Canada border near Morgan, Montana, southeast to Steele City, Nebraska. In total, the proposed Project would consist of approximately 1,203 miles of new, 36-inch diameter pipeline, with 327 miles in Canada and 876 miles in the United States. The United States portion of the proposed Project is summarized on Table 2.1-1.

Table 2.1-1 Keystone XL Project Facilities by State

State	New Construction Pipeline Miles	Ancillary Facilities
Montana	285.65	6 Pump Stations, 84 Access Roads, 25 Main Line Valves (MLVs)
South Dakota	315.30	7 Pump Stations, 59 Access Roads, 13 MLVs
Nebraska[a]	274.44	5 Pump Stations, 48 Access Roads, 4 MLVs
Kansas	0	2 Pump Stations

[a] There were four MLVs proposed in the Final EIS for the proposed route. Other Nebraska valve locations are being determined at this time. The total number of pump stations and access roads has been preliminarily identified based on the proposed route.

The proposed Project would involve the construction of 20 pump stations. Eighteen of these would be constructed and operated along the newly built pipeline on land parcels ranging in area from 5 to 15 acres; there would be six pump stations in Montana, seven in South Dakota, and five in Nebraska. The locations of four of the Nebraska pump stations have yet to be finally determined. Two additional pump stations would be constructed in Kansas along the existing Keystone Cushing Extension; one pump station would be on an undeveloped site in Clay County, and the second would be in Butler County. These pump stations would enable the proposed Project to maintain the pressure required to transport crude oil at the desired throughput volumes.

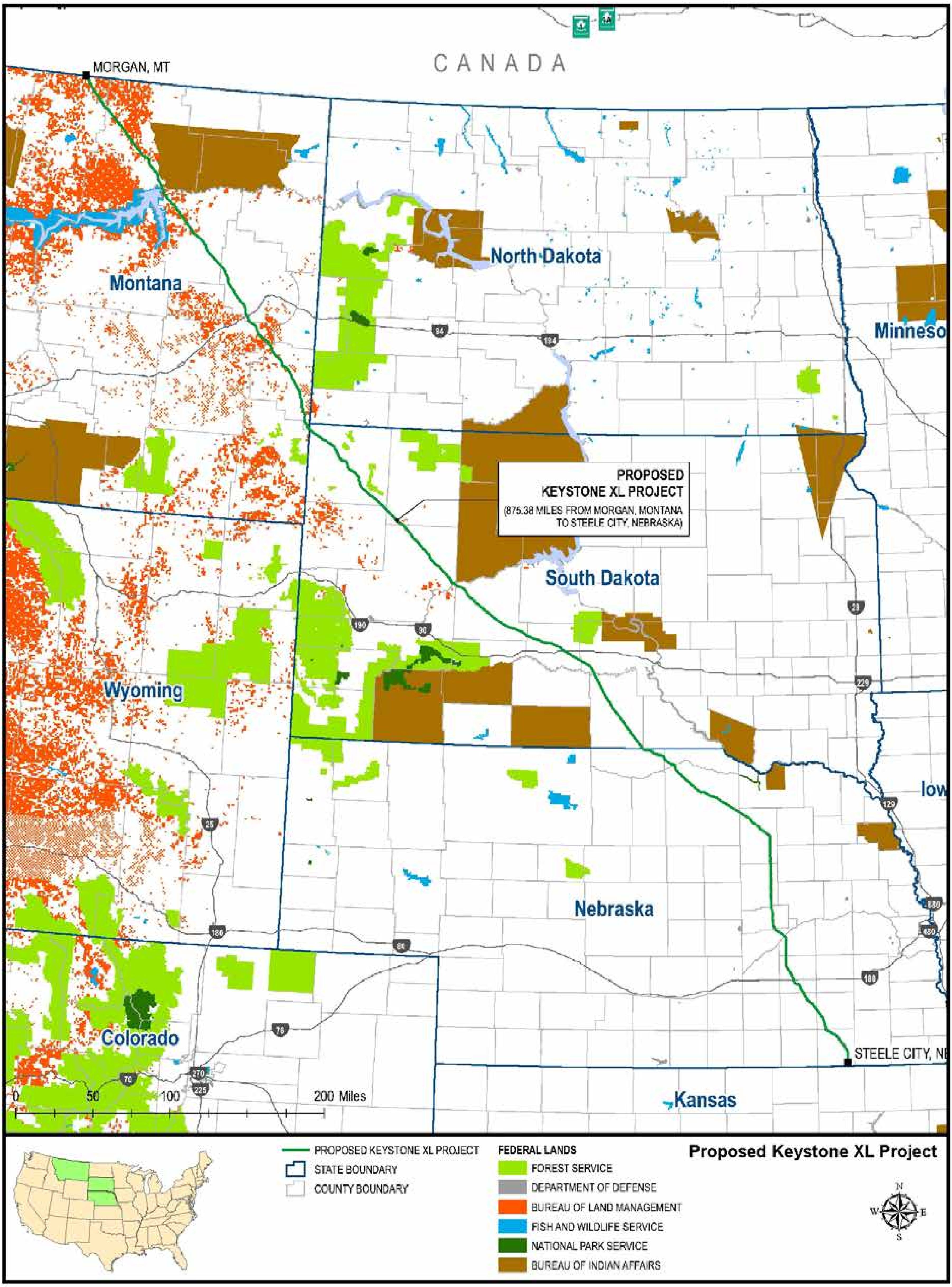


Figure 2.1.5-1 Project Overview

-Page Intentionally Left Blank-

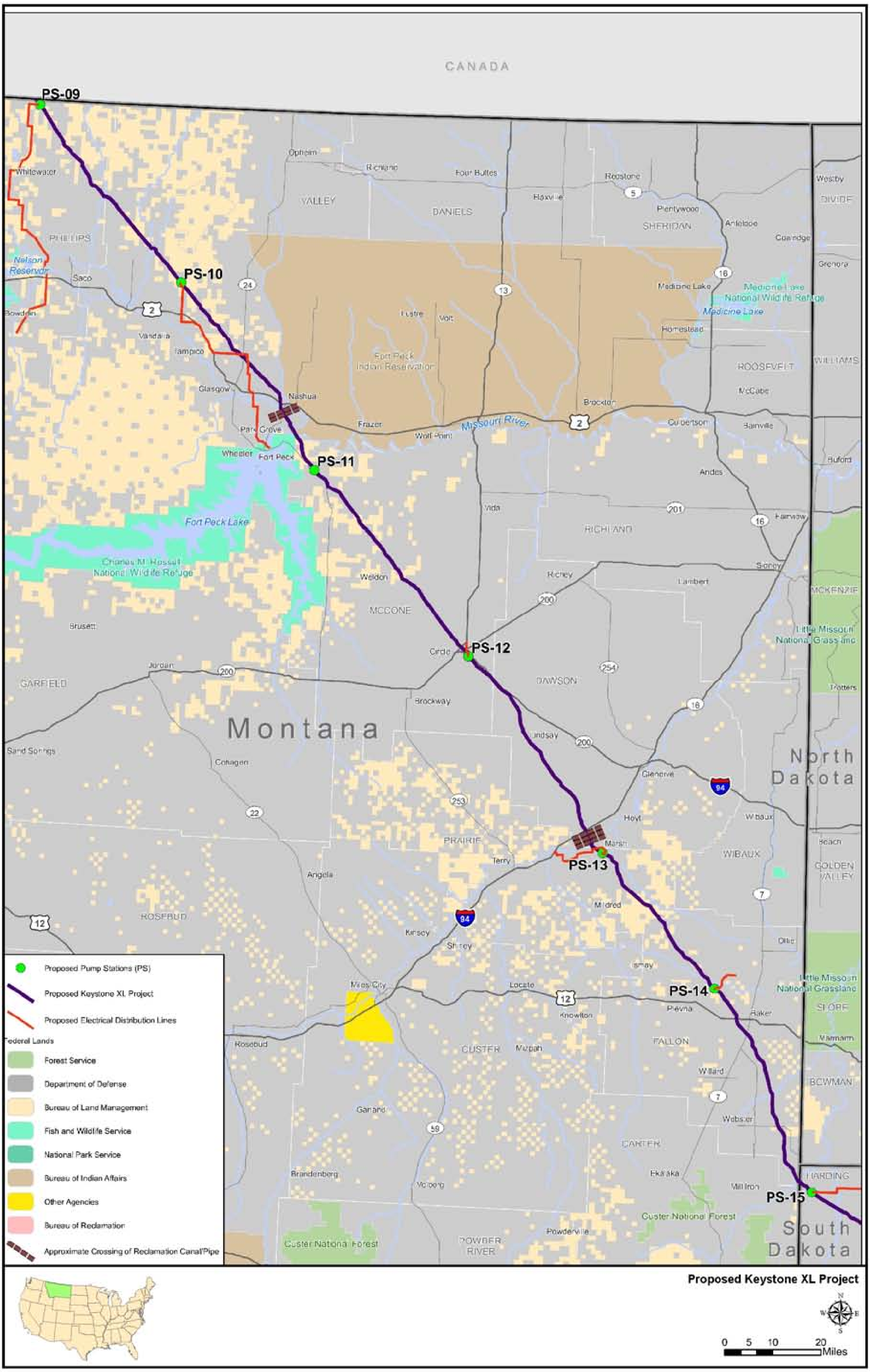


Figure 2.1.5-2 Project Overview (Montana)

-Page Intentionally Left Blank-

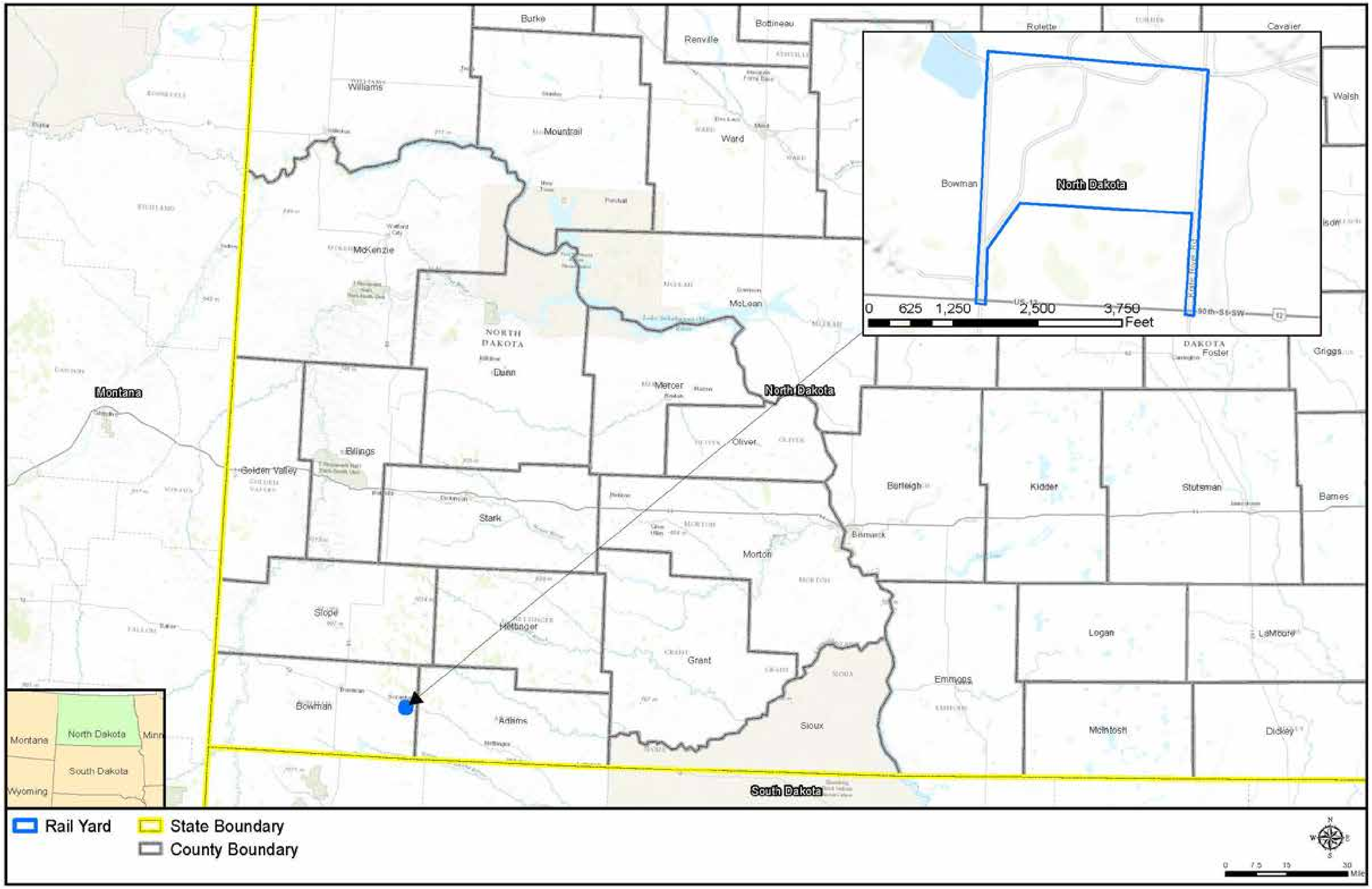


Figure 2.1.5-3 Project Overview (North Dakota)

-Page Intentionally Left Blank-

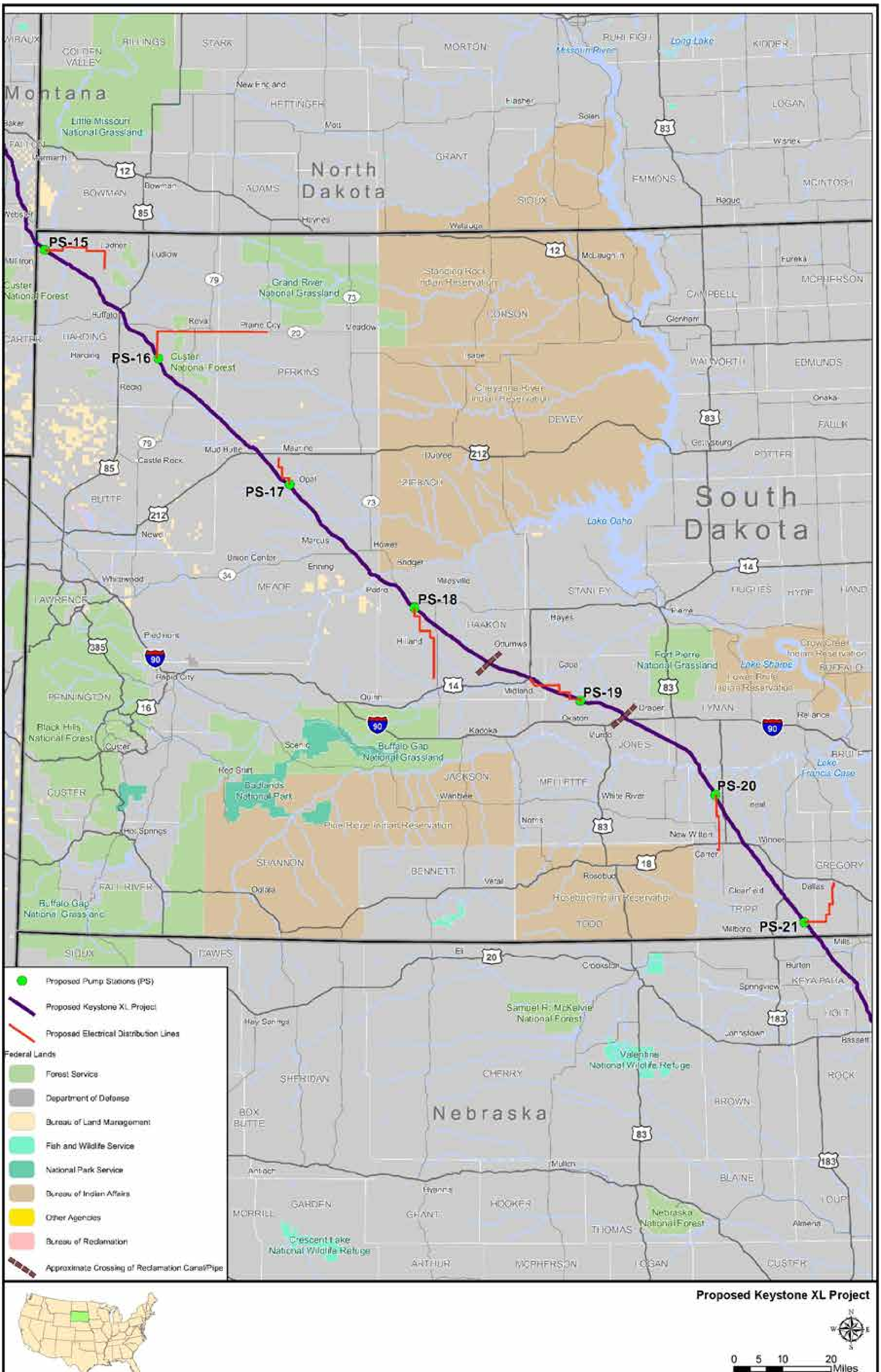


Figure 2.1.5-4 Project Overview (South Dakota)

-Page Intentionally Left Blank-

Figure 2.1.5-5 Project Overview (Nebraska)

-Page Intentionally Left Blank-

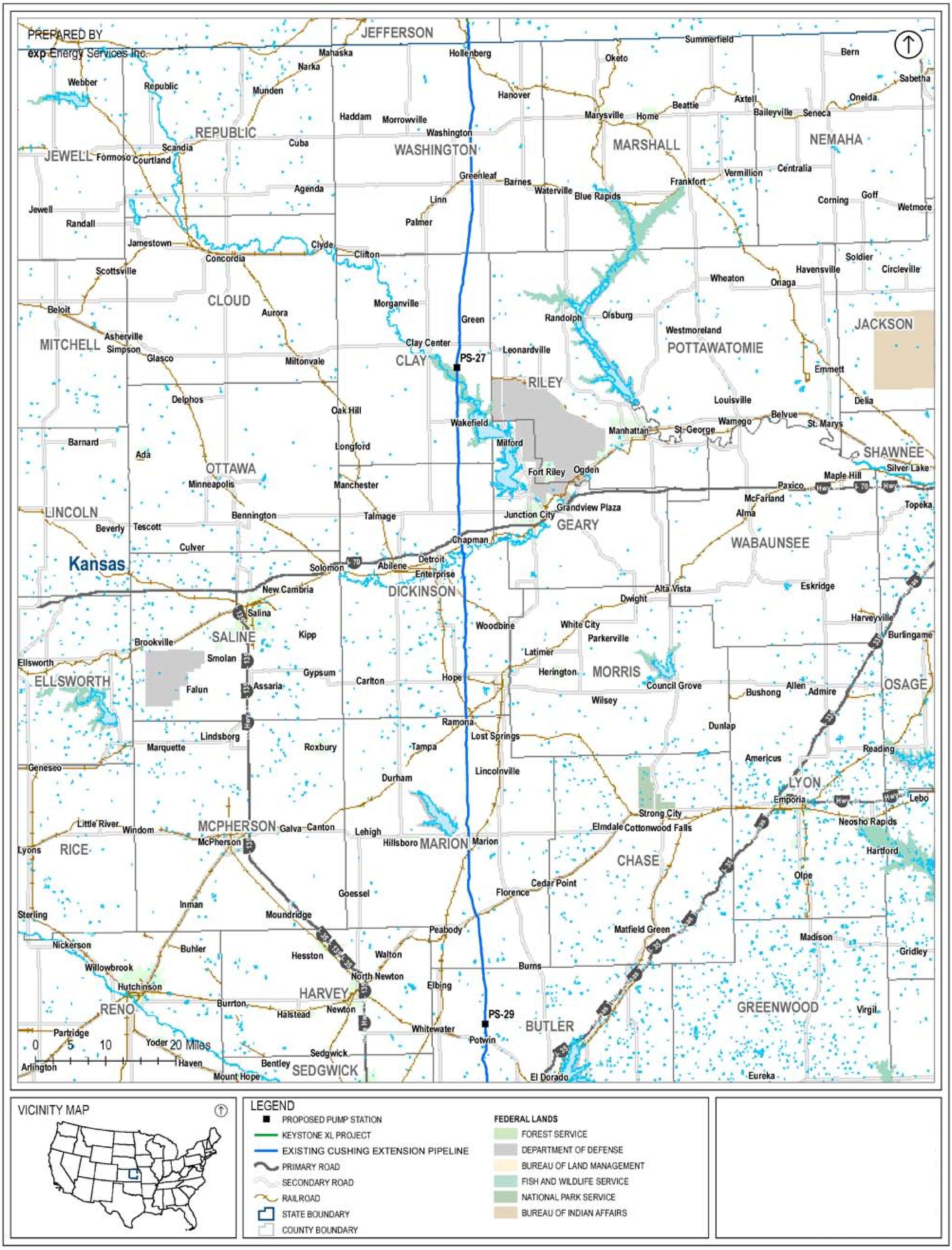


Figure 2.1.5-6 Project Overview (Kansas)

-Page Intentionally Left Blank-

2.1.2 Pipeline Construction Overview

In the United States, the proposed Project is planned to be constructed as follows: 36-inch diameter pipeline, approximately 875 miles in length, from the United States/Canada Border at Morgan, Montana, to Steele City, Nebraska, which would be constructed with 10 mainline spreads[1], varying in length between approximately 80 and 94 miles each, in 2013 and 2014.

2.1.3 Ancillary Facilities Summary

In addition to the pipeline, Keystone proposes to install and operate aboveground facilities consisting of 20 new pump stations on the Keystone XL line. Of these, two pump stations would be constructed in Kansas along the existing Keystone Cushing Extension. One pump station would be constructed on an undeveloped site in Clay County; another pump station would be constructed in Butler County (see Figure 2.1.5-6). These pump stations would enable the proposed Project to maintain the pressure required to transport crude oil at the desired throughput volumes. Additionally, Keystone would install and operate one delivery facility, 42 intermediate MLVs (with some in Nebraska that have yet to be determined), in-line inspection facilities, and two densitometer facilities; all of which would be located within the permanent easement or within the footprint of a pump station. Further, check valves would be located within the intermediate MLVs downstream of major river crossings. For a discussion of operations and maintenance that would be performed on ancillary facilities for the proposed Project, see Section 2.1.11, Operation and Maintenance.

Additional facilities such as power lines required for the pump stations, remotely operated valves, and densitometers would be required to obtain permits from appropriate agencies and would be installed and operated by local power providers and not by Keystone. A summary of impacts associated with the installation of the power lines is contained in Section 6 of the September 7, 2012, Environmental Report (exp Energy Services Inc. 2012).

2.1.4 Land Requirements

Surface disturbance associated with the construction and operation of the proposed Project is summarized on Table 2.1-2. Approximately 16,277 acres of land would be disturbed during construction of the proposed facilities. After construction, the temporary ROW would be restored and returned to its previous land use. After construction is complete, approximately 5,584 acres would be retained as permanent ROW and for permanent ancillary facilities. All disturbed acreage would be restored and returned to its previous aboveground land use after construction, except for approximately 286 acres of permanent ROW, which would not be restored but would serve to provide adequate space for aboveground facilities including pump stations and valves, for the life of the proposed pipeline. In addition, four pump stations would be relocated in Nebraska and would permanently convert agricultural land to industrial use, approximately 40 to

[1] Large, linear construction projects typically are broken into arbitrary, manageable lengths called “spreads,” and utilize various specialized crews; each crew with its own responsibilities. As one crew completes its work, the next crew moves into position to complete its piece of the construction process.

60 acres. Almost all of the land affected by the construction and operation of the proposed Project would be privately owned; BLM oversees the management of the majority of the federally owned lands.

Table 2.1-2 Summary of Lands Affected for the Proposed Project

State	Facility	Lands Affected (Acres) Construction	Lands Affected (Acres) Operation
Montana	Pipeline ROW	3,784.42	1,727.75
	Additional Temporary Workspace Areas	518.64	0.00
	Pipe Stockpile Sites, and Contractor Yards	517.28	0.00
	Construction Camp	242.88	0.00
	Pump Stations and Delivery Facilities	65.79	65.79
	Access Roads	337.03	47.41
	Rail Sidings[a] (3 Sites)	60.00	0.00
	Montana Subtotal	5,526.05	1,840.95
South Dakota	Pipeline ROW	4,153.37	1,906.83
	Additional Temporary Workspace Areas	460.37	0.00
	Pipe Stockpile Sites, and Contractor Yards	605.07	0.00
	Construction Camp	250.04	0.00
	Pump Stations and Delivery Facilities[b]	65.63	65.63
	Access Roads	222.96	24.34
	Rail Sidings[a] (3 Sites)	60.00	0.00
	South Dakota Subtotal	5,817.44	1,996.80
North Dakota	Pipeline ROW	0.00	0.00
	Additional Temporary Workspace Areas	0.00	0.00
	Pipe Stockpile Sites, and Contractor Yards	56.05	0.00
	Construction Camp	0.00	0.00
	Pump Stations and Delivery Facilities[b]	0.00	0.00
	Access Roads	0.00	0.00
	North Dakota Subtotal	56.05	0.00

State	Facility	Lands Affected (Acres) Construction	Operation
Nebraska	Pipeline ROW	3,637.41	1,663.68
	Additional Temporary Workspace Areas	226.88	0.00
	Pipe Stockpile Sites, and Contractor Yards[c]	680.00	0.00
	Construction Camp[c]	80.00	0.00
	Pump Stations and Delivery Facilities[b]	67.12	67.12
	Access Roads	70.50	0.00
	Rail Sidings[a]	100.00	0.00
	Nebraska Subtotal	4,861.91	1,730.80
Kansas	Pipeline ROW	0.00	0.00
	Additional Temporary Workspace Areas	0.00	0.00
	Pipe Stockpile Sites, and Contractor Yards	0.00	0.00
	Construction Camp	0.00	0.00
	Pump Stations and Delivery Facilities[b]	15.15	15.15
	Access Roads	0.00	0.00
	Rail Sidings[a]	0.00	0.00
	Kansas Subtotal	15.15	15.15
Total =		**16,276.60**	**5,583.78**

[a] Rail siding acreage represents 20 acres for each site. Total acreage for rail sidings = 140 acres.

[b] Pump station acreages are a nominal number set at 15 acres. Except PS-26, actual acreage was used (7.12 acres).

[c] These are estimated acreages; locations have not been finalized at this time.

2.1.5 Pipeline Right-of-Way

The installation of the proposed 36-inch diameter pipeline would occur within a 110-foot-wide construction ROW, consisting of a 60-foot temporary construction ROW and a 50-foot permanent ROW. Figures 2.1.5-7 and 2.1.5-8 illustrate the typical construction ROW and equipment work locations where the pipeline would be co-located with an existing linear feature. The construction ROW would be reduced to 85 feet in certain areas, which could include some habitat for federally protected and candidate species, wetlands, cultural sites, shelterbelts, residential areas, and commercial/industrial areas. Thirty miles (3 percent) of the proposed Project would be located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remainder of the proposed pipeline, approximately 845 miles (97 percent), would be situated in a new ROW.

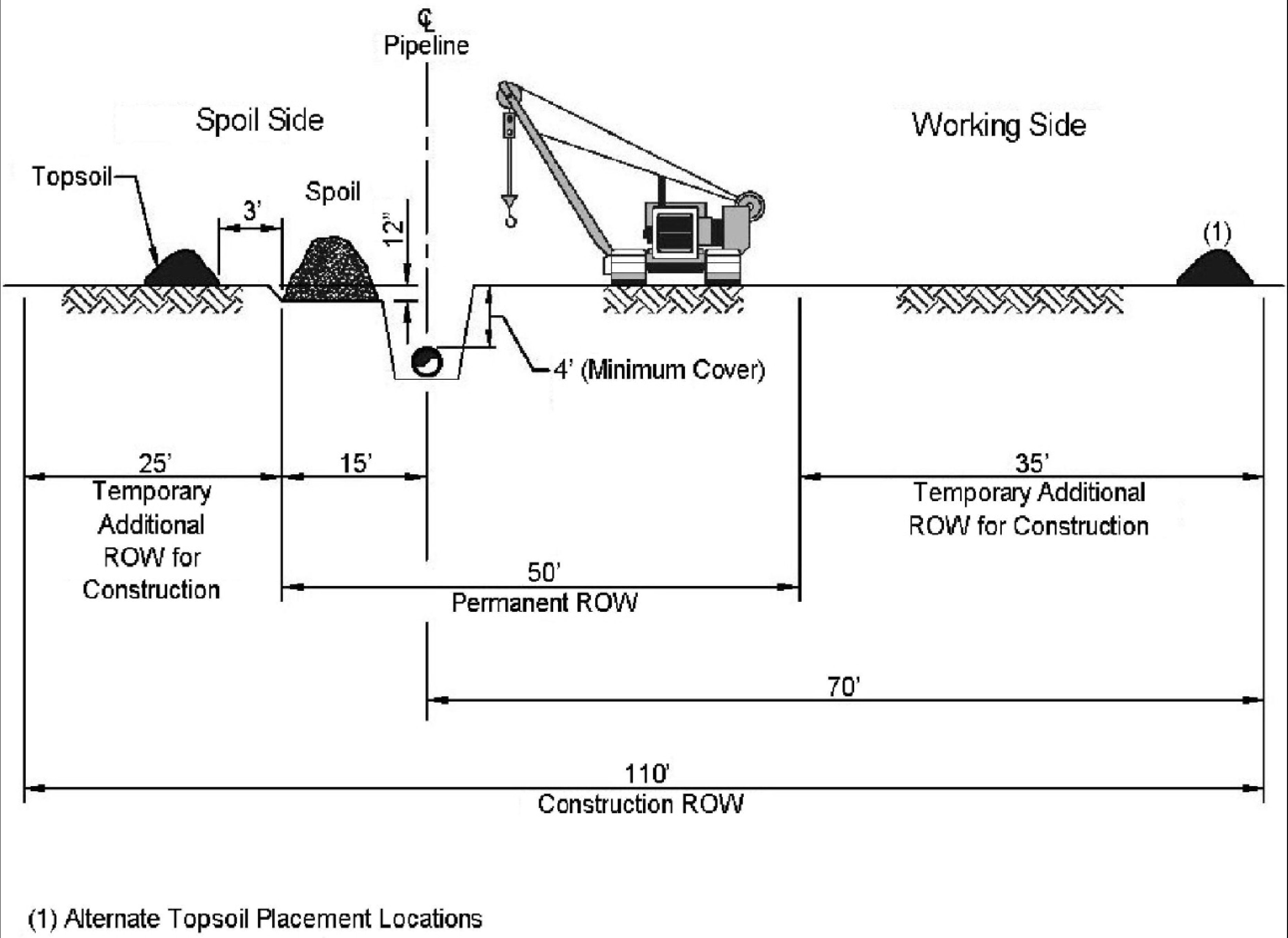
2.1.6 Additional Temporary Workspace Areas

In addition to the typical construction ROW, Keystone has identified typical types of additional temporary workspace areas (TWAs) that would be required. These include areas requiring special construction techniques (e.g., river, wetland, and road/rail crossings, horizontal directional drilling (HDD), entry and exit points, steep slopes, and rocky soils) and construction staging areas. These preliminary areas have been used to quantify impacts covering about 1,206 acres for the proposed Project (with some in Nebraska that have yet to be determined).

The location of additional TWAs would be adjusted as the proposed Project continues to be refined. This would involve the adjustment of additional temporary workspace, as necessary, related to federally protected and candidate species habitat or proximity, actual wetland and waterbody locations, side-hill cuts, and rough terrain. Keystone would adjust additional TWAs at the prescribed setback distance from wetland and waterbody features unless impractical and as determined on a site-specific basis. Examples where a prescribed setback may not be practical include areas where topography does not allow for spoil storage further from streams (e.g., steep slopes located a short distance from streams or wetlands), areas where multiple stream and/or wetland features are in close proximity, and areas where trees or other features are identified for avoidance near streams and wetlands.

2.1.7 Pipe Stockpile Sites, Railroad Sidings, and Contractor Yards

Extra workspace areas outside of the temporary construction ROW covering approximately 1,226 acres would be required during the construction of the proposed Project to serve as pipe storage sites, railroad sidings, and contractor yards (Table 2.1-3) (with some in Nebraska that have yet to be determined). Pipe stockpile sites along the pipeline route have typically been identified in proximity to railroad sidings. To the extent practical, Keystone would use existing commercial/industrial sites or sites that previously were used for construction. Existing public or private roads would be used to access each yard. Both pipe stockpile sites and contractor yards would be used on a temporary basis and would be restored, as appropriate, upon completion of construction. Survey of pipe stockpile sites, railroad sidings, and contractor yards would be completed prior to construction.



Proposed Keystone XL Project

Figure 2.1.5-7 Typical 110-foot Construction ROW (36-inch Pipeline) with Topsoil Removal only over Trench Line

-Page Intentionally Left Blank-

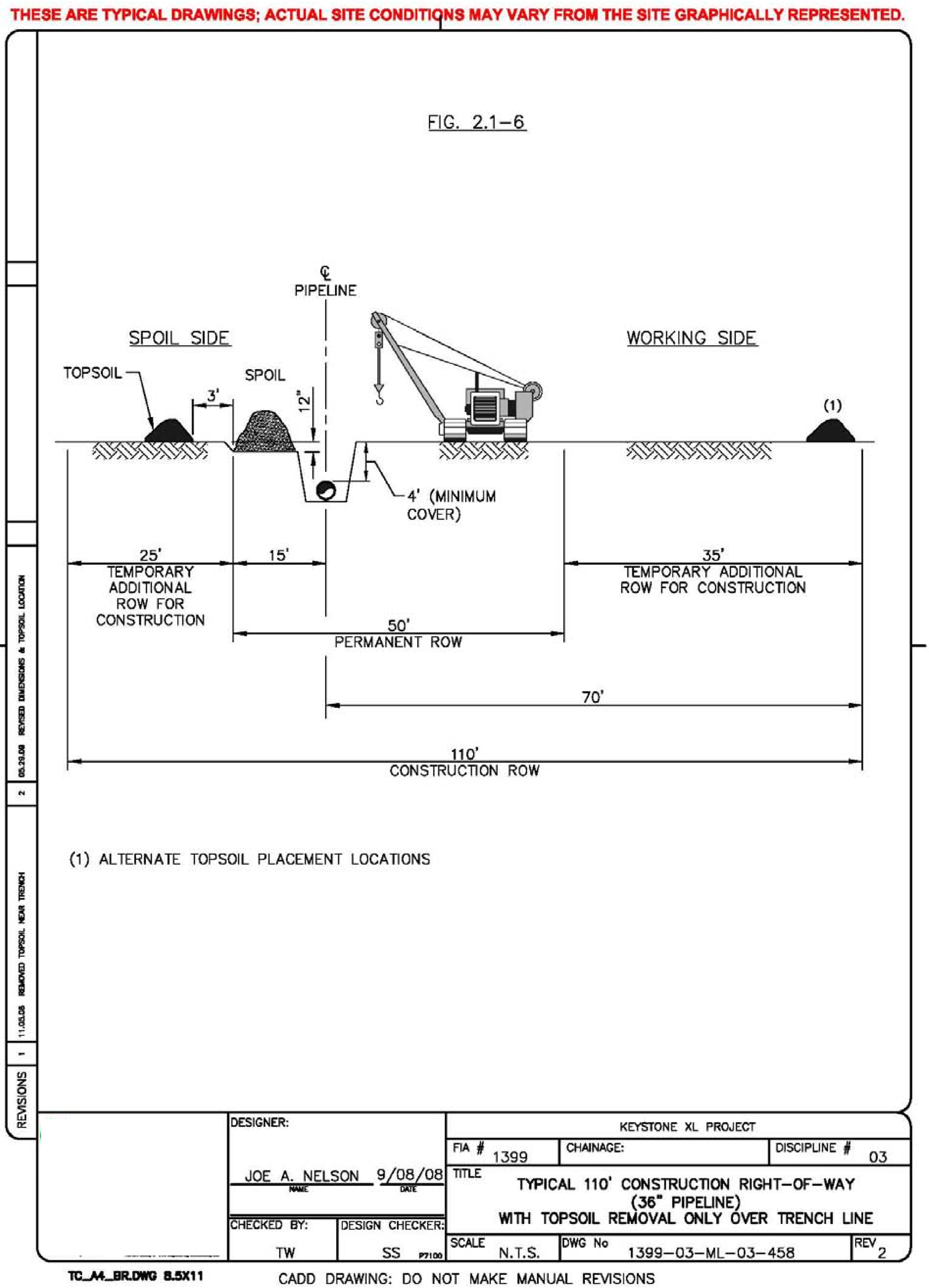


Figure 2.1.5-8 Typical 110-foot Construction ROW (36-inch Pipeline) Spoil Side Adjacent and Co-located to Existing Pipeline

-Page Intentionally Left Blank-

Table 2.1-3 Locations and Acreages of Proposed Pipe Storage Sites, Railroad Sidings, and Contractor Yards

State	County	Type(s) of Yards	Number of Yards	Combined Acreage
Montana	Dawson, McCone, Valley, Fallon	Contractor Yards	5	161
	Roosevelt, Sheridan, Prairie	Rail Sidings[a]	3	60
	Phillips, Dawson, McCone, Valley, Fallon	Pipe Yard Stockpile Sites	9	283
South Dakota	Tripp, Haakon, Jones	Contractor Yards	7	258
	Hughes, Lyman, Pennington	Rail Sidings[a]	3	60
	Tripp, Haakon, Jones	Pipe Yard Stockpile Sites	11	347
North Dakota	Bowman	Pipe Yard Stockpile Sites	1	56
Nebraska	Fillmore, Greeley, Holt, Jefferson, Merrick, York	Contractor Yards	8	233
	Butler, Hamilton, Holt, Jefferson, Valley	Rail Sidings	5	100
	Antelope, Boone, Fillmore, Hamilton, Holt, Jefferson, Keya Paha, Nance	Pipe Yard Stockpile Sites	11	447
Kansas	NA	NA	NA	NA
		TOTAL		1,805

[a] Nominal Acreage of 20 acres each assigned to rail sidings.

Locations and Acreages of Proposed Contractor Camps

State	County	Type(s) of Yards	Number of Yards	Combined Acreage
Montana	McCone, Valley (2), Fallon	Contractor Camps	44	243[1]
South Dakota	Tripp, Harding, Meade	Contractor Camps	3	250
North Dakota	NA	NA	NA	NA
Nebraska	Holt	Contractor Camp	1	80
Kansas	NA	NA	NA	NA
		TOTAL		573

[a] Additional camp in Valley County has not yet been sited, acreage TBD.

2.1.8 Construction Camps

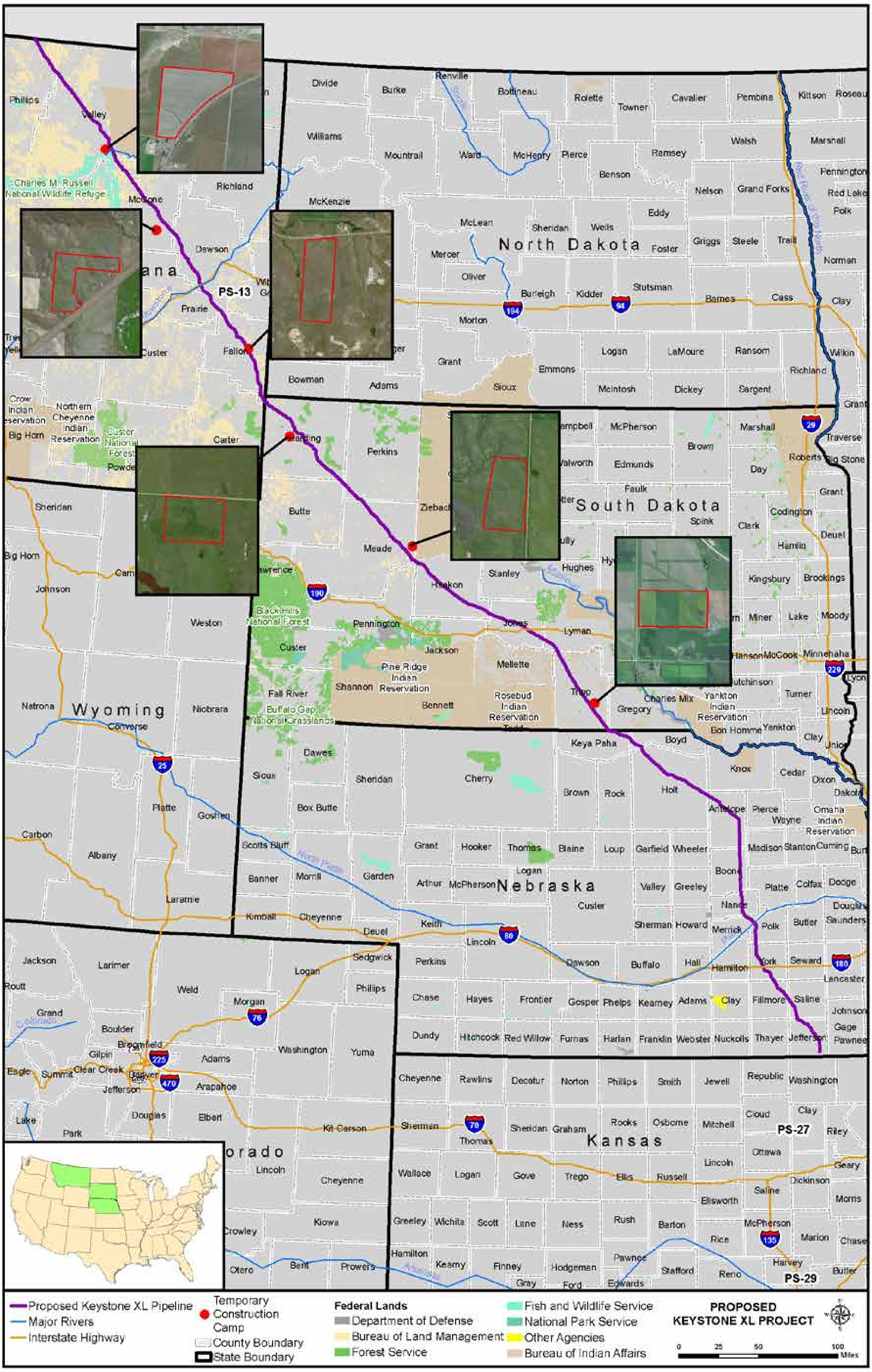
Some areas within Montana, South Dakota, and Nebraska do not have sufficient temporary housing in the proposed route vicinity for all construction personnel working in those areas. Temporary work camps would be constructed to meet the workforce housing needs in these remote locations. A total of eight temporary construction camps would be established; four construction camps would be in Montana (McCone, Valley [2], and Fallon counties), and three camps would be in South Dakota (Tripp, Harding, and Meade counties) (the approximate location of six of these camps is shown in Figure 2.1.8-1). The total acreage for the seven camps planned in Montana and South Dakota for which acreage is known equals 492.92 acres (exact acreage for the fourth camp in Montana is not yet known, subject to final acquisition of the proposed site). Keystone is also investigating the possibility of building a temporary construction camp at a suitable location in Holt County in northern Nebraska that would alleviate short-term housing in that area during construction. Each camp would be approximately 80 acres in size, which would include about 30 acres for pipe and/or contractor yard space, as well as the camp itself. The number and size of the camps would be determined based on the time available to complete construction and to meet Keystone's commercial commitments. All construction camps would be permitted, constructed, and operated consistent with applicable county, state, and federal regulations. The relevant regulations that would be complied with and the permits required for the construction camps are presented on Table 2.1-4.

Table 2.1-4 Construction Camp Permits and Regulations

State	Permit or Approval	Agency[b]	Submitted by
Montana	Water Main Certified Checklist	MDEQ	Keystone
	Sewer Main Certified Checklist	MDEQ	Keystone
	NOI and SWPPP	MDEQ	Keystone
	Building Permits	MBCB	Camp Contractor
	Driveway Approach Permit	MDT	Camp Contractor
	Work Camp Establishment Plan Review	DPHHS	Camp Contractor
South Dakota	Application for Permit to Discharge Wastewater	DENR	Keystone
	Notice of Intent	DENR	Keystone
	SWPPP	DENR	Keystone
	Temporary Permit to Use Public Waters	DENR	Keystone
	Food License Application	DOH	Camp Contractor
	Application for Highway Access Permit	SD DOT	Keystone
Nebraska	Public Water Supply & Distribution System[a]	NDEQ	Keystone
	Wastewater Collection & Treatment System[a]	NDEQ	Keystone
	NOI and SWPPP	NDEQ	Keystone
	Food License Application	NDHHS	Camp Contractor
	Building Permits	Local	Camp Contractor
	State Fire Marshal	NE SFM	Camp Contractor

Source: exp Energy Services Inc. 2012.

[a] Submittal for approval requires the submission of a design report, plans, and specifications certified by a professional engineer.
[b] MDEQ = Montana Department of Environmental Quality, MBCB = Montana Building Code Bureau; MDT = Montana Department of Transportation, DPHHS = Department of Public Health and Human Services; SD DOT = South Dakota Department of Transportation; NDEQ = Nebraska Department of Environmental Quality; NDHHS = Nebraska Department of Health and Human Services; NE SFM = Nebraska State Fire Marshal; SDDENR = South Dakota Department of Environment and Natural Resources; DOH = Department of Health.



Source: exp Energy Services, Inc. 2012.

Figure 2.1.8-1 Proposed Temporary Construction Camp

-Page Intentionally Left Blank-

2.1.8.1 Camp Design

Each construction camp site would be established on an approximately 80-acre site (the sites could range from 50 acres up to 100 acres with the inclusion of a contractor yard). Of that area, 30 acres would be used as a contractor yard, and approximately 50 acres would be used for housing and administration facilities. The camps would be constructed using modular units and would provide the required infrastructure and systems necessary for complete food service, housing, and personal needs including a convenience store, recreational and fitness facilities, entertainment rooms and facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, and security units. Each camp would also have a medical infirmary to provide first aid and routine minor medical services for the workers and staff. The contractor managing the camps would be responsible to comply with federal, state, and local laws on all waste disposal. There would also be dedicated medical transport vehicles for both the camp sites and for the construction ROW.

The camps' housing facilities would consist of modular, dormitory-like units that house roughly 28 occupants per unit. The units would have heating and air conditioning systems. The camps would be set up with the housing areas clustered together, with both shared and private wash rooms.

Each camp would contain 600 beds and 300 recreational vehicle spots. Keystone conservatively intends to permit each camp for 1,000 residents to allow for those instances where there may be more than 1 person in a recreational vehicle. Potable water would be provided by drilling a well where feasible and allowed. If Keystone cannot get a permit from the state to install a water well, water would be hauled to the camp from the nearest permitted municipal supply, as discussed below.

If an adequate supply cannot be obtained from a well, water would be obtained from municipal sources or trucked to each camp. Siting of the camps near existing municipal water sources would be a key consideration in locations currently experiencing water restrictions or drought conditions. A self-contained wastewater treatment facility would be included in each camp except where it is practicable to use a licensed and permitted publicly owned treatment works. Wastewater treated on site would undergo primary, secondary, and tertiary treatment consisting of solids removal, bioreactor treatment, membrane filtration, and ultraviolet exposure. Final effluent discharge would be consistent with all applicable regulatory requirements. If a publicly owned treatment works is used, Keystone would either pipe or truck wastewater to the treatment facility.

Electricity for the camps would either be generated on site through diesel-fired generators, or would be provided by local utilities from an interconnection to their distribution system. Keystone would contract with a camp supplier that would provide security 24 hours per day, 7 days per week at each camp. Keystone would work with the supplier to ensure that as many local employees are hired as possible to staff the camps.

2.1.8.2 Camp Use

The camps are planned to service the needs of the proposed Project workforce. As a result, the dormitories do not include facilities for families. Most of the workers would be transported to and from the ROW each day by buses. In addition, individual crews and workers, due to the nature of their work, would be transported to and from job sites by utility trucks or by welding rigs. Also, support workers such as mechanics, parts and supply staff, and supervisory personnel would drive to the ROW in separate vehicles.

Based on the current construction schedule, the camps would operate in standby mode during the winter (from December through March or April). Each camp would have sufficient staff to operate and secure the camp and associated systems during that time period.

2.1.8.3 Camp Decommissioning

Decommissioning camps would be accomplished in two stages. First, all infrastructure systems would be removed and either hauled away for reuse, recycled, or disposed of in accordance with regulatory requirements. Each site would then be restored and reclaimed in accordance with permit requirements and the applicable procedures described in Keystone's Construction, Mitigation, and Reclamation Plan (CMRP) (Appendix B).

2.1.9 Access Roads

The proposed Project would use public and existing private roads to provide access to most of the construction ROW. Acreages of access roads are provided on Table 2.1-2 for Montana and South Dakota with Nebraska being determined upon approval of the route identified in the Supplemental Environmental Report for the Nebraska Reroute submittal to NDEQ September 5, 2012 (exp Energy Services Inc. 2012). Paved roads are not likely to require improvement or maintenance prior to or during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling would generally be restricted to the existing road footprint; road widening is also required in some areas. Private roads and any new temporary access roads would be used and maintained only with permission of the landowner or land management agency.

Access pads[2] would be placed within the construction ROW at crossings of public and private roads, requiring a total of about 20,160 cubic yards of gravel. The approximate number of road crossings requiring access pads is 1,344.

Approximately 191 temporary access roads[3] would be provided for construction, which would cover approximately 631 acres.

There would be 38 permanent access roads[4] to Project facilities, which would cover approximately 72 acres.

[2] An access pad is area constructed of rock aggregate located at construction access locations. The access pad allows for the reduction in the amount of mud transported onto paved roads by construction vehicles or surface runoff. Access pads provide an area where mud can be removed by vehicle tires traveling over the gravel pad before entering public roads.

[3] There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed.

[4] The number in Nebraska is still to be determined.

Keystone proposes to construct short, permanent access roads from public roads to the pump stations and intermediate MLVs. The estimated acres of disturbance associated with the new proposed access roads are listed on Table 2.1-2. Prior to construction, Keystone would finalize the location of new permanent access roads along with any temporary access roads. At a minimum, construction of new permanent access roads would require completing cultural resources and biological surveys, along with the appropriate State Historic Preservation Office and USFWS consultations and approvals. Other state and local permits also may be required prior to construction. In the future, newly created access road maintenance would be the responsibility of Keystone.

Existing public and private roads would be used to provide access to most of the construction ROW. Paved roads would not likely require improvement or maintenance prior to or during construction. However, the road infrastructure would be inspected prior to construction to ensure that the roads, bridges, and cattle guards would be able to withstand oversized vehicle use during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling would generally be restricted to the existing road footprint; however, some roads may require widening in some areas.

To the extent Keystone is required to conduct maintenance of any county roads, it would be done pursuant to an agreement with the applicable county. In the event that oversized or overweight loads would be needed to transport construction materials to the proposed Project work sites, Keystone would submit required permit applications to the appropriate state regulatory agencies.

Approximately 191 temporary access roads would be needed to provide adequate access to the construction sites. Private roads and any new temporary access roads would be used and maintained only with permission of the landowner or the appropriate land management agency. There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed. Keystone would also construct short, permanent, access roads from public roads to the pump stations, delivery facilities, and intermediate MLVs. Approximately 21 permanent access roads would be needed in Montana and 17 permanent access roads in South Dakota. The number in Nebraska is still to be determined.

The final locations of new, permanent, access roads would be determined prior to construction. At a minimum, construction of new permanent access roads would require completion of cultural resources and biological surveys and consultations and approvals of the appropriate State Historic Preservation Office and USFWS office. Keystone would comply with all federal, state, and local requirements prior to construction. Newly created access roads maintenance would be Keystone's responsibility, as described below.

The acreages of access roads are included in the listing of lands affected on Table 2.1-2. Access road temporary and permanent disturbance estimates are based on the 30-foot roadway width required to accommodate oversized vehicles. In developing the disturbance acreages, all non-public roads were conservatively estimated to require upgrades and maintenance during construction.

2.1.9.1 Roadway Maintenance, Repair, and Safety

Keystone would work with state and local road officials, the pipeline construction contractor, and a third-party road consultant to identify routes to be used for moving materials and equipment between storage and work yards to the pipeline, valve, and pump station construction sites. When these routes are mutually agreed upon, the road consultant would document the existing conditions of roads, including a video record. When construction is completed, the same parties would review the road conditions and Keystone would restore the roads to their preconstruction condition or better. Keystone would pay for this restoration.

Keystone would also perform a preliminary evaluation to determine the design-rated capacity of bridges anticipated to be used during construction and would inspect all bridges it intends to use prior to construction and confirm that the bridge capacity is adequate for the anticipated weights. An alternate route would be used where the bridges are not adequate to handle the maximum weight. Keystone would also inspect cattle guard crossings prior to their use. If they are determined to be inadequate to handle anticipated construction traffic, Keystone may place mats on crossings, establish an alternate crossing, enhance existing structures, or install new infrastructure with the landowner's approval, dependent upon specific conditions. Keystone would pay for all such actions.

During construction, Keystone and the pipeline contractor would maintain roads used for construction in a condition that is safe for both the public and work force. Local road officials would be actively engaged in the routine assessment of road conditions.

Keystone would follow all federal, state, and local safety plans and signage as set forth in the various applicable Manuals of Uniform Traffic Control issued by federal, state, or local agencies for streets and highways along the proposed route. This would include compliance with all state and local permits pertaining to road and crossing infrastructure usage.

Keystone would require that each construction contractor submit a road-use plan prior to mobilization, coordinate with the appropriate state and county representatives to develop a mutually acceptable plan, and obtain all necessary road use permits. The road-use plans would identify potential scenarios that may occur during construction based on surrounding land use, known recreational activities, and seasonal influences (such as farming), and would establish measures to reduce or avoid effects to local communities. Keystone would also have inspection personnel monitor road-use activities to ensure that the construction contractors comply with the road-use plans and stipulations of the road.

Some counties in Montana stipulate that a private individual conducting county road maintenance becomes liable for traffic safety on the road. Where this is required, Keystone has stated it would be done pursuant to an agreement with the applicable county, and such agreements would address potential liability, including appropriate indemnity and insurance provisions. Keystone has the necessary insurance coverage to address such potential liability.

2.1.10 Aboveground Facilities

The proposed Project would require approximately 286 acres of land, other than permanent ROW, along the proposed Project segments for aboveground facilities, including pump stations, densitometer sites, intermediate MLVs, and delivery facilities (Table 2.1-5). Nebraska's aboveground facilities are still being evaluated at this point in time. Gravel would be used to stabilize the land for permanent facilities, including pump stations, valve sites, and permanent access roads.

Table 2.1-5 Summary of Aboveground Facilities

State	Facility	Areas Affected (Acres) Construction	Operation
Montana	Pump Stations	65.79	65.79
	Intermediate MLV Locations	1.15	1.15
	Montana Subtotal	66.94	66.94
South Dakota	Pump Stations	65.63	65.63
	Intermediate MLV Locations	0.70	0.70
	South Dakota Subtotal	66.33	66.33
Nebraska	Pump Stations[a]	67.12	67.12
	Intermediate MLV Locations[b]	0.23	0.23
	Nebraska Subtotal	67.35	67.35
Kansas	Pump Stations	15.15	15.15
	Kansas Subtotal	15.15	15.15
	Total	215.82	215.82

[a] Pump station acreages are a nominal number set at 15 acres. Except PS-26, actual acreage was used (7.12 acres).

[b] Nebraska valve locations for the MLVs on the proposed route are pending. Acreage identified in the above table is for the four sites along the Final EIS portion of the proposed route identified in the NDEQ Supplemental Environmental Report for the Nebraska Reroute.

2.1.10.1 Pump Stations

New pump stations, each situated on approximately 15-acre sites, would be constructed for the proposed Project (Table 2.1-5). Each new pump station would consist of up to six pumps driven by electric motors, an electrical equipment shelter, a variable frequency drive equipment shelter, an electrical substation, one sump tank, a remotely operated MLV, a communication tower, a small maintenance building, and a parking area for station maintenance personnel. Stations would operate on locally purchased electric power and would be fully automated for unmanned operation.

The pump stations would have an uninterruptable power supply for all communication and specific controls equipment in the case of a power failure. Backup generators at pump stations are planned as an alternate supply of power for communication and control equipment. As a result of the generators, fuel storage tanks will be required at pump stations. Keystone will install the proper containment structures around the tanks.

Communication towers at pump stations would generally be approximately 33 feet in height. However, antenna height at select pump stations, as determined upon completion of a detailed engineering study, may be taller, but in no event would exceed a maximum height of 190 feet. Communication towers would be constructed without guy wires.

The pipe entering and exiting the pump station sites would be located below grade. The pipe manifolding connected with the pump stations would be above ground. Keystone would use down-lighting wherever possible to minimize impacts to wildlife and would install a security fence around the entire pump station site. Inspection and maintenance personnel would access the pump stations through a gate that would be locked when no one is at the pump station.

2.1.10.2 Other Aboveground Facilities

Keystone proposes to construct 44 intermediate MLV sites along the new pipeline ROW (MLVs in the Nebraska portion of the proposed Project MLVs have yet been determined). Intermediate MLVs would be sectionalizing block valves generally constructed within a fenced, 50 by 50-foot site located on the permanent easement. Remotely operated intermediate MLVs would be located at major river crossings and upstream of sensitive waterbodies and at intermediate locations. Additional remotely operated MLVs would be located at pump stations. These remotely operated valves can be activated to shut down the pipeline in the event of an emergency to minimize environmental impacts in the unlikely event of a spill. The actual spacing intervals between the MLVs and intermediate MLVs would be based on the pump station locations, waterbodies wider than 100 feet, and sensitive environmental resources; federal regulations and the 57 Project-specific conditions (Appendix C, PHMSA Conditions for Keystone XL and Keystone Compared to 49 CFR 195) developed by the United States Department of Transportation (USDOT), Pipeline Hazardous Materials Safety Administration (PHMSA); and hydraulic profile considerations.

The proposed Project would be designed to permit in-line inspection of the entire length of the pipeline with minimal service interruption. Pig launchers and/or receivers would be constructed and operated completely within the boundaries of the pump stations or delivery facilities. Launchers and receivers would allow pipeline in-line inspection with high-resolution internal line inspection tools and maintenance cleaning pigs.

2.1.10.3 Construction Procedures

The proposed facilities would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the regulations at 49 CFR 195 (*Transportation of Hazardous Liquids by Pipeline)*, other applicable federal and state regulations, and in accordance with the 57 Project-specific special conditions recommended by PHMSA and agreed to by Keystone (see 2.1.11, Operation and Maintenance, and Appendix B, CMRP). These regulations are intended to ensure adequate protection for the public and to prevent crude oil pipeline accidents. Among other design standards, 49 CFR 195 and the proposed Project-specific special conditions specify pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Environmental Compliance Monitoring

To manage construction impacts, Keystone would implement its CMRP (Appendix B). The CMRP contains procedures that would be used throughout the proposed Project to avoid or minimize impacts. Subsections of the CMRP address specific environmental conditions. Procedures to restore impacts to the permanent ROW are also described in the CMRP.

The following is one example of the mitigation measures (Appendix B, CMRP, Section 7.1) that will be implemented by Keystone for crossing waterbodies and wetlands:

- The contractor shall comply with requirements of all permits issued for the waterbody crossings by federal, state, or local agencies.

- Waterbody includes any areas delineated as jurisdictional, natural, or artificial stream, river, or drainage, and other permanent waterbodies such as ponds and lakes:
  - Minor waterbody includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of construction.
  - Intermediate waterbody includes all waterbodies greater than 10 feet wide, but less than or equal to 100 feet wide at the water's edge at the time of construction.
  - Major waterbody includes all waterbodies greater than 100 feet wide at the water's edge at the time of construction.

In the event a waterbody crossing is located within or adjacent to a wetland crossing, the contractor, to the extent practicable, would implement the CMRP provisions in both Section 6, Wetland Crossings, and Section 7, Waterbodies and Riparian Lands (see Appendix B, CMRP).

The contractor must supply and install advisory signs in a readily visible location along the construction right-of-way at a distance of approximately 100 feet on each side of the crossing and on all roads which provide direct construction access to waterbody crossing sites. Signs must be supplied, installed, maintained, and then removed upon completion of the proposed Project. Additionally, the contractor must supply and install signs on all intermediate and major waterbodies accessible to recreational boaters warning boaters of pipeline construction operations.

The contractor must not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating within 100 feet of any waterbody. The contractor must not refuel construction equipment within 100 feet of any waterbody. If the contractor must refuel construction equipment within 100 feet of a waterbody, it must be done in accordance with the requirements outlined in the Section 3 of the CMRP (Appendix B). All equipment maintenance and repairs must be performed in upland locations at least 100 feet from waterbodies and wetlands. All equipment parked overnight must be at least 100 feet from a watercourse or wetland, if possible. Equipment must not be washed in streams or wetlands. Throughout construction, the contractor must maintain adequate flow rates to protect aquatic life and to prevent the interruption of existing downstream uses.

Keystone may allow modification of the specifications as necessary to accommodate specific situations or procedures. Any modifications must comply with all applicable regulations and permits. The contractor will not be making changes to the project outside the surveyed study corridor on which the consultation will be based. Acreage impacts of changes will be tracked to keep within the total used for calculating mitigation. If the contractor requires a project change outside the previously surveyed corridor, then Keystone will be coordinating with the USFWS prior to implementation of the required change.

The Project's Spill Prevention, Control, and Countermeasure (SPCC) Plan (Appendix D) would be implemented to avoid or minimize the potential for harmful spills and leaks during construction. The plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures. Keystone would use environmental inspectors on each construction spread and coordinate with USFWS and other agencies as appropriate.

The environmental inspectors would review the proposed Project activities daily for compliance with state, federal, and local regulatory requirements and would have the authority to stop specific tasks as approved by the chief inspector. The inspectors would also be able to order corrective action in the event that construction activities violate CMRP provisions, landowner requirements, or any applicable permit requirements. The compliance manager for Keystone will be the point person for communication with the USFWS as required. The monitors that will be used in the field will be reporting to the environmental inspectors, who in turn report to the compliance manager. If required, the monitors will discuss any required interpretation or issues with the USFWS with the compliance manager.

Mitigation and other measures contained in the September 7, 2012 TransCanada Keystone XL Pipeline Project Environmental Report would apply to the basic design and construction specifications applicable to lands disturbed by the proposed Project (exp Energy Services 2012). This approach would enable construction to proceed with a single set of specifications, irrespective of the ownership status (federal versus non-federal) of the land being crossed. On private lands, these requirements may be modified slightly to accommodate specific landowner requests or preferences or state-specific conditions.

2.1.10.4 General Pipeline Construction Procedures

Before starting construction at a specific site, engineering surveys of the ROW centerline and additional TWAs would be finalized and the acquisition of ROW easements and any necessary acquisitions of property in fee would be completed.

As proposed, the pipeline would be constructed in 10 spreads (or sequences) of approximately 45 to 120 miles long (see Table 2.1-6). Final spread configurations and the final construction schedule may result in the use of additional spreads or fewer shorter or longer spreads. Figure 2.1.10-1 depicts the approximate location of each spread. Pipeline construction generally proceeds as a moving assembly line as shown in Figure 2.1.10-2 and summarized below. Standard pipeline construction is composed of specific activities, including survey and ROW staking, clearing and grading, pipe stringing, bending, trenching, welding, lowering in, backfilling, hydrostatic testing, and cleanup. In addition to standard pipeline construction methods, special construction techniques would be used where warranted by site-specific conditions. These special techniques would be used when constructing across rugged terrain, waterbodies, wetlands, paved roads, highways, and railroads (Section 2.1.11.2).

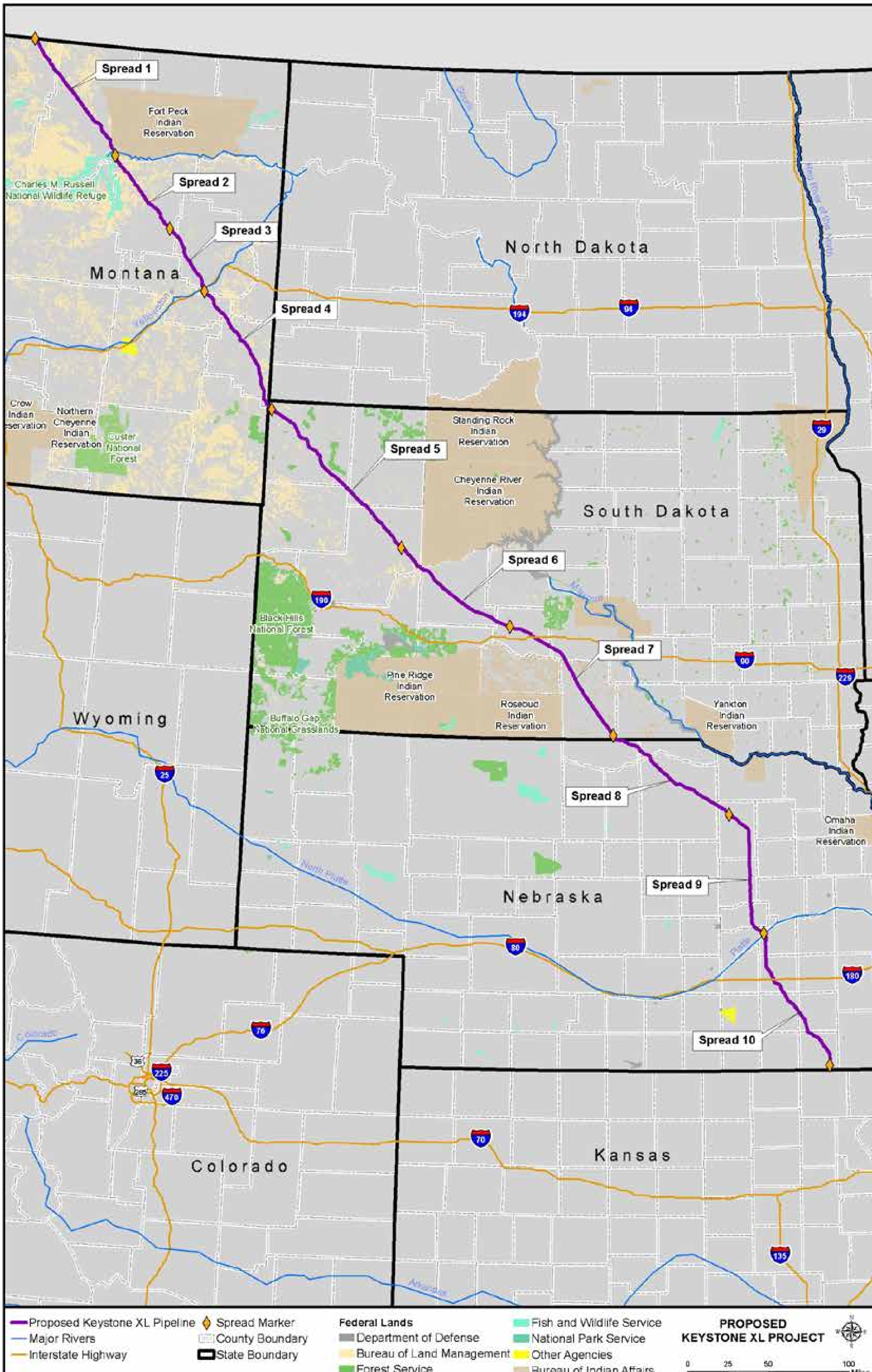
Table 2.1-6 Pipeline Construction Spreads Associated with the Proposed Project

State	Miles by State	County	Spread Number	Location (Mile Post)	Approximate Length of Construction Spread (Miles)
Montana	285.65	Phillips, Valley	Spread 1	0-90	90
		Valley, McCone	Spread 2	90-151.48	61.48
		McCone, Dawson	Spread 3	151.48-197.68	46.2
		Dawson, Prairie, Fallon	Spread 4	197.68-288.63	90.95

State	Miles by State	County	Spread Number	Location (Mile Post)	Approximate Length of Construction Spread (Miles)
South Dakota	315.29	Harding			
		Harding, Butte, Perkins, Meade	Spread 5	288.63-410.75	122.12
		Meade, Pennington	Spread 6	410.75-500.44	89.69
		Haakon, Jones			
		Jones, Lyman, Tripp	Spread 7	500.44-598.86	98.42
		Tripp	Spread 8	598.86-691.78	92.92
Nebraska	274.44	Tripp, Keya Paha, Boyd, Hold, Antelope			
		Antelope, Boone, Nance, Merrick, Polk	Spread 9	691.78-775.67	83.89
		Polk, York, Fillmore, Saline, Jefferson	Spread 10	775.67-875.38	99.71

Source: exp Energy Services Inc. 2012.

-Page Intentionally Left Blank-



Source: exp Energy Services, Inc. 2012.

Figure 2.1.10-1 Construction Spreads

-Page Intentionally Left Blank-

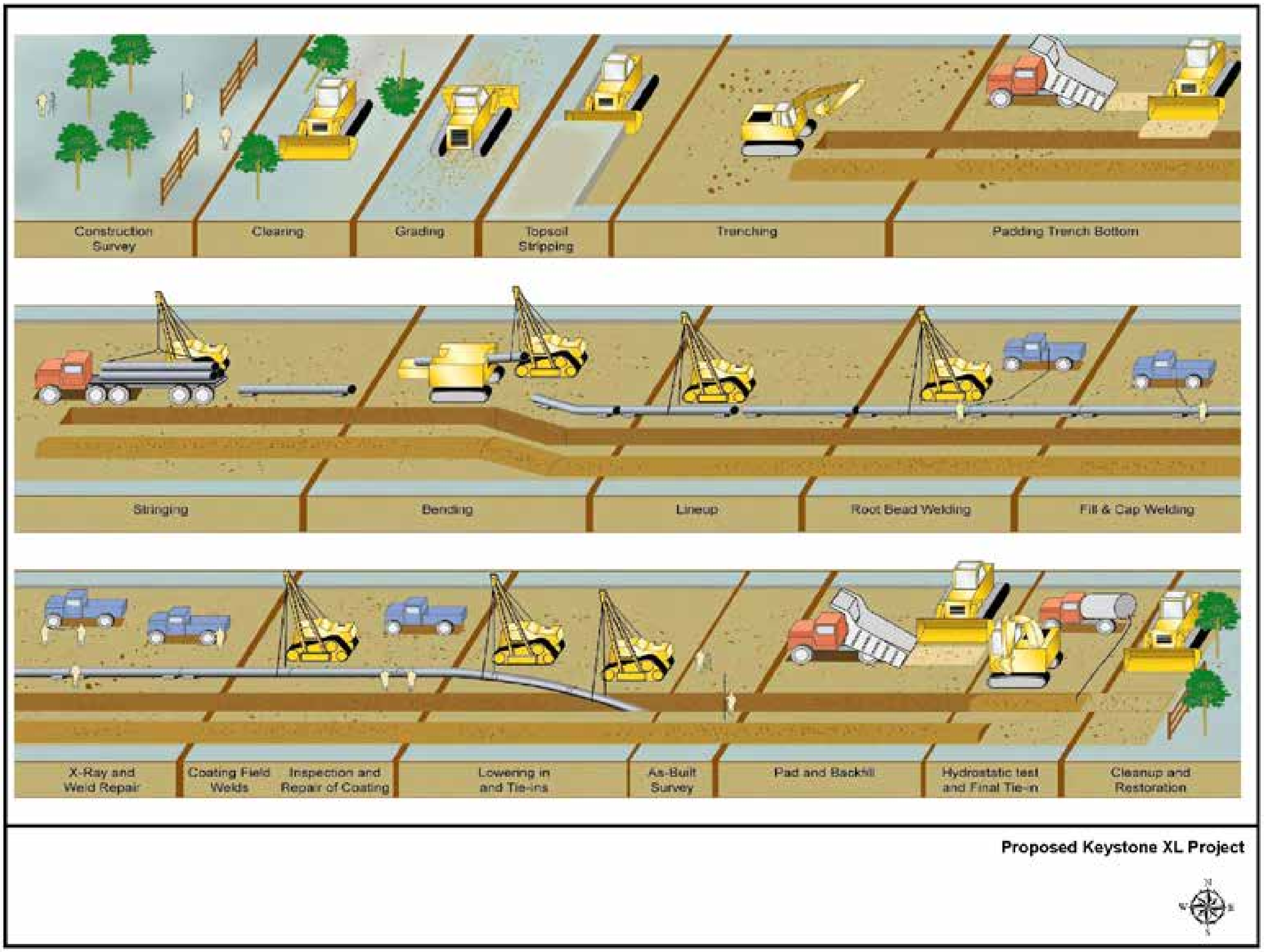


Figure 2.1.10-2 Typical Pipeline Construction Sequence

-Page Intentionally Left Blank-

Normal construction activities would be conducted during daylight hours, with the following exceptions.

- Completion of critical tie-ins on the ROW may occur after daylight hours. Completion requires tie-in welds, non-destructive testing, and sufficient backfill to stabilize the ditch.
- HDD operations may be conducted after daylight hours, if determined by the contractor to be necessary to complete a certain location. In some cases, that work may be required continuously until the work is completed; this may last one or more 24-hour days. Such operations may include drilling and pull-back operation, depending on the site and weather conditions, permit requirements, schedule, crew availability, and other factors.
- HDD operations are proposed to occur landward of forested corridors to provide a vegetative screen from operations, including night operations. However, in some instances there may be a lack of a vegetative screen between HDD operations and the water feature in an area with active tern and plover colonies or in an area providing suitable roosting habitat for whooping cranes during spring and fall migrations. Should night work be necessary in those instances, downshielding of lights will be done to prevent illumination of the area and disturbance to nesting interior least terns, piping plovers, and roosting whooping cranes.
- While not anticipated in typical operations, certain work may be required after the end of daylight hours due to weather conditions, for safety, or for other Project requirements.

2.1.10.5 Survey and Staking

Before construction begins at any given location, the limits of the approved work area (i.e., the construction ROW boundaries and any additional TWAs) would be marked and the location of approved access roads and existing utility lines would be flagged. Landowner fences would be braced and cut and temporary gates and fences would be installed to contain livestock, if present. Wetland boundaries and other environmentally sensitive areas also would be marked or fenced for protection at this time. Fencing would be removed following pipeline construction. Before the pipeline trench is excavated, a survey crew would stake the proposed trench centerline and any buried utilities along the ROW.

2.1.10.6 Clearing and Grading

A clearing crew would follow the fencing crew and would clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Standard agricultural implements would be used on agricultural lands and standard machinery used in timber clearing would be used in forested lands. The amount of top soil stripping would be determined in consultation with the landowner (based on agricultural use) and the Natural Resources Conservation Service (NRCS). Full ROW stripping for forested lands would be avoided as practicable.

Temporary erosion control measures such as silt fence would be installed prior to or immediately after vegetation removal along slopes leading to wetlands and riparian areas (for erosion control maintenance procedures, see Appendix B, CMRP, Section 4.5.1, Temporary Erosion and Sediment Control. Grading would be conducted where necessary to provide a reasonably level work surface. Where the ground is relatively flat and does not require grading, rootstock would be left in the ground. More extensive grading would be required in steep side slopes or vertical areas and where necessary to safely construct the pipe along the ROW.

2.1.10.7 Trenching

The trench would be excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, the trench would be 7 to 8 feet deep and 4 to 5 feet wide in stable soils. In most areas, the USDOT requires a minimum of 30 inches of cover and as little as 18 inches in rocky areas. To reduce the risk of third-party damage, Keystone proposes to exceed the federal depth of cover requirements in most areas. In all areas, except consolidated rock areas, the depth-of-cover for the pipeline would be a minimum of 48 inches (Table 2.1-7). In consolidated rock areas, the minimum depth of cover would be 36 inches. Trenching may precede bending and welding or may follow based on several factors, including soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction. Generally, the crews on each construction spread are synchronized with the welding crews for efficiency. The amount of open trench is minimized to the extent possible. When rock or rocky formations are encountered, tractor-mounted mechanical rippers or rock trenchers would be used to fracture the rock prior to excavation. After the pipeline is padded, excavated rock would be used to backfill the trench to the top of the existing bedrock profile.

Table 2.1-7 Minimum Pipeline Cover

Location	Normal Cover (inches)	Cover in Rock Excavation Areas (inches)
Most areas	48	36
All waterbodies	60	36
Dry creeks, ditches, drains, washes, gullies, etc.	60	36
Drainage ditches at public roads and railroads	60	48

In agricultural land, rocks that are exposed on the surface due to construction activity would be removed from the ROW prior to and after topsoil replacement to an equivalent quantity, size, and distribution of rocks as that on adjacent, undisturbed lands. Rock clearing may be carried out with a mechanical rock picker or by manual means, provided that topsoil preservation is assured. Rock removed from the ROW would be hauled off the landowner's premises or disposed of on the landowner's premises at a location that is mutually acceptable to the landowner and to Keystone.

Topsoil segregation would be based on site-specific circumstances and one of the following procedures would be implemented. Topsoil would be separated from subsoil only over the trench, over the trench and spoil side, or over the full width of ROW. Keystone may also conduct full ROW topsoil stripping in other areas where it is beneficial from a construction stand-point, or where required by landowners or land managers. When soil is removed from only the trench, topsoil would typically be piled on the near side of the trench and subsoil on the far side of the trench. This would allow for proper soil restoration during the backfilling process (see Figures 2.1.5-7 and 2.1.5-8). When soil is removed from both the trench and the spoil side, topsoil would typically be stored on the edge of the near side of the construction ROW and the subsoil on the spoil side of the trench. In areas where the ROW would be graded to provide a level working surface and where there is another need to separate topsoil from subsoil, topsoil would be removed from the entire area to be graded and stored separately from the subsoil.

Topsoil would be piled such that the mixing of subsoil and topsoil would not occur. Gaps would be left between the spoil piles to prevent storm water runoff from backing up or flooding. Temporary erosion control measures such as silt fence would be installed to prevent runoff into surface waters (see Appendix B, CMRP).

2.1.10.8 Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally coated pipe approximately 80 feet long (also referred to as "joints") would be transported by truck over public roads and along authorized private access roads to the ROW and placed or "strung" along the ROW.

After the pipe sections are strung along the trench and before joints are welded together, individual sections of the pipe would be bent to conform to the trench contours by a track-mounted, hydraulic pipe-bending machine. For larger bend angles, fabricated bends may be used.

After the pipe sections are bent, the joints would be welded together into long strings and placed on temporary supports. During welding, the pipeline joints would be lined up and held in position until securely joined. Keystone proposes to non-destructively inspect 100 percent of the welds using radiographic, ultrasonic, or other USDOT-approved methods. Welds that do not meet established specifications would be repaired or removed. Once the welds are approved, a protective epoxy coating would be applied to the welded joints. The pipeline would then be electronically inspected or "jeeped" for faults or holidays in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating would be repaired before the pipeline is lowered into the trench.

In rangeland areas used for grazing, construction activities potentially can hinder the movement of livestock if the livestock cannot be relocated temporarily by the owner. Construction activities may also hinder the movement of wildlife. To minimize the impact on livestock and wildlife movements during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock and wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to provide an avenue of escape for animals that may fall into the trench.

2.1.10.9 Lowering In and Backfilling

Before the pipeline is lowered into the trench, the trench would be inspected to be sure it is free of livestock or wildlife, as well as rock and other debris that could damage the pipe or its protective coating. In areas where water has accumulated, dewatering may be necessary to permit inspection of the bottom of the trench. Discharge of water from dewatering would be accomplished in accordance with applicable discharge permits. The pipeline then would be lowered into the trench.

On sloped terrain, trench breakers (e.g., stacked sand bags or foam) would be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline. The CMRP provides a figure depicting a trench breaker and the intervals are discussed in CMRP Section 4.5.3, Trench Plugs (Appendix B). The intervals are determined in the field based on slope length and height. The trench would then be backfilled using the excavated material.

In rocky areas, the pipeline would be protected with an abrasion-resistant coating or rock shield (fabric or screen that is wrapped around the pipe to protect the pipe and its coating from damage by rocks, stones, and roots). Alternatively, the trench bottom would be filled with padding material (e.g., sand, soil, or gravel) to protect the pipeline. An estimated 85,000 cubic yards of padding material would be required. No topsoil would be used as padding material. Topsoil would be returned to its original horizon after subsoil is backfilled in the trench.

2.1.10.10 Hydrostatic Testing

The pipeline would be hydrostatically tested in sections typically 30 to 50 miles long to ensure the system is capable of withstanding the operating pressure for which it is designed. This process involves isolating the pipe segment with test manifolds, filling the segment with water, pressurizing the segment to a pressure a minimum of 100 percent specified minimum yield strength at the high point elevation of each test section, and maintaining that pressure for a minimum 8-hour period. Fabricated assemblies may be tested prior to installation in the trench for a 4-hour period. The hydrostatic test would be conducted in accordance with 49 CFR 195.

Water for hydrostatic testing would generally be obtained from rivers, streams, and municipal sources in close proximity to the pipeline and in accordance with federal, state, and local regulations. Intakes would be screened to prevent entrainment of fish, and intake and discharge locations would be determined with construction contractors. A preliminary list of potential hydrostatic test water sources is included on Table 2.1-8. Generally the pipeline would be hydrostatically tested after backfilling and all construction work that would directly affect the pipe is complete. If leaks are found, they would be repaired and the section of pipe retested until specifications are met. Chemicals are not added to the test water. The water is generally the same quality as the source water since there are no additives to the water. Water used for the testing would then be returned to the source or transferred to another pipe segment for subsequent hydrostatic testing. After hydrostatic testing, the water would be tested to ensure compliance with the National Pollutant Discharge Elimination System discharge permit requirements, treated if necessary, and discharged.

Table 2.1-8 Potential Water Sources along the Project Route[a, b, c, d]

County	Approximate Milepost	Waterbody Name	Maximum Water Withdrawal (million gallons)
Montana			
Phillips	25.4	Frenchman Creek	32
Valley	83.4	Milk River	32
Valley/McCone	89.2 to 89.3	Missouri River	55
Dawson	196.4	Yellowstone River	55
South Dakota			
Harding	295.1	Little Missouri River	27
Harding	315	Gardner Lake	67
Perkins	360.97	North Fork Moreau River	36
Meade	429.9	Cheyenne River	35
Haakon	486	Bad River	22
Tripp	541.3	White River	39

County	Approximate Milepost	Waterbody Name	Maximum Water Withdrawal (million gallons)
Nebraska[e]			
Boyd	618.1	Keya Paha River	37
Holt	626.1	Niobrara River	37
Antelope	713.3	Elk Horn River	37
Nance	761.7	Loup River	37
Polk	775.2	Platte river	47

[a] These volumes are estimated at this time. Final volumes will be included in appropriate water use permits for each state. At that time, the state permitting agency will determine which rivers can be used, if they approve the volume, and any permitting conditions associated with the withdrawals. Water will be used for hydrostatic test water, drilling mud for HDD operations, and dust control.

[b] Additional water sources will be needed for dust control. These additional sources will require lower volumes (up to 6 million gallons on average). Dust control sources would be permitted in accordance with state permit requirements and could include existing irrigation wells.

[c] Ground water sources (irrigation wells) may be used for water sources instead of the rivers listed above. These water sources and the volumes to be used would be purchased from landowners and would be permitted in accordance with state requirements.

[d] These water volumes would be required for both years of construction.

[e] Additional water would be withdrawn from irrigation wells in several counties crossed by the project for approximately 55 million gallons of water for dust control, hydrostatic testing, and HDD operations.

During droughts, surface water withdrawal permits from larger rivers with existing water rights (e.g., Platte River) would be regulated by state regulatory agencies to preserve existing water rights and environmental requirements. If inadequate water is available from rivers, Keystone would use alternative water sources nearby such as local private wells or municipal sources for HDD operations, mainline hydrostatic testing, and dust control during these dry conditions. Keystone has indicated that in the event surface water is unavailable, groundwater would be used for HDD operations, hydrostatic testing, and dust control. Water would be purchased from nearby willing sellers and would not increase overall groundwater use.

The used hydrostatic test water would be discharged either to the source waterbody within the same water basin or to a suitable upland area near the test discharge. To reduce the discharge velocity to upland areas, energy dissipating devices would be employed. Energy dissipation devices that are consistent with BMP protocols include:

- Splash Pup – a splash pup consists of a piece of large diameter pipe (usually over 20-inch outside diameter) of variable length with both ends partially blocked. The splash pup is welded perpendicular to the discharge pipe. As the discharge hits against the pup’s inside wall, the velocity is rapidly reduced and the water allowed to flow out either end. A splash pup design variation, commonly called a diffuser, has capped ends and many holes punched in the pup to diffuse the energy.
- Splash Plate – The splash plate is a quarter section of 36-inch pipe welded to a flat plate and attached to the end of a 6-inch-diameter discharge pipe. The velocity is reduced by directing the discharge stream into the air as it exits the pipe. This device would also be effective for most overland discharge.

- Plastic Liner – In areas where highly erodible soils exist or in any low-flow drainage channel, it is a common practice to use layers of construction fabric to line the receiving channel for a short distance. A small load of rocks may be used to keep the fabric in place during the discharge. Additional methods, such as the use of plastic sheeting or other material to prevent scour, would be used as necessary to prevent excessive sedimentation during dewatering.
- Straw Bale Dewatering Structure – Straw bale dewatering structures are designed to dissipate and remove sediment from the water being discharged. Straw bale structures could be used alone for on-land discharge of hydrostatic test water or in combination with other energy dissipating devices for high volume discharges. Dewatering filter bags may be used as alternatives to straw bale dewatering structures.

Hydrostatic test water would not be discharged into state-designated exceptional value waters, waterbodies that provide habitat for federally protected or candidate species, or waterbodies designated as public water supplies, unless appropriate federal, state, or local permitting agencies grant written permission. To avoid impacts from introduced species, no inter-basin transfers (discharge) of hydrostatic test water would occur without specific permitting approval to discharge into an alternative water basin. Discharge lines would be securely supported and tied down at the discharge end to prevent whipping during discharge. Hydrostatic testing is discussed further in Section 8 of the CMRP (Appendix B).

2.1.10.11 Pipe Geometry Inspection

The pipeline would be inspected prior to final tie-ins using an electronic caliper (geometry) pig to ensure the pipeline does not have any dents, bulging, or ovality that might be detrimental to pipeline operation.

2.1.10.12 Final Tie-ins

Following successful hydrostatic testing, test manifolds would be removed and the final pipeline tie-in welds would be made and inspected.

2.1.10.13 Commissioning

After the final tie-ins are complete and inspected, the pipeline would be cleaned and dewatered. Commissioning involves verifying that equipment has been installed properly and is working, that controls and communications systems are functional, and that the pipeline is ready for service. In the final step, the pipeline would be prepared for service by filling the line with crude oil.

2.1.10.14 Cleanup and Restoration

During cleanup, construction debris on the ROW would be disposed of and work areas would be final-graded. Preconstruction contours would be restored as closely as possible. Segregated topsoil would be spread over the ROW surface and permanent erosion controls would be installed. After backfilling, final cleanup would begin as soon as weather and site conditions permit. Every reasonable effort would be made to complete final cleanup (including final grading and erosion control device installations) within approximately 20 days after backfilling the trench (approximately 10 days in residential areas), subject to weather and seasonal constraints. Construction debris would be cleaned up and taken to an appropriate disposal facility.

After permanent erosion control devices are installed and final grading complete, all disturbed work areas except annually cultivated fields would be seeded as soon as possible. Seeding is intended to stabilize the soil, revegetate areas disturbed by construction, and restore native vegetation. Timing of the reseeding efforts would depend on weather and soil conditions and would be subject to the prescribed rates and seed mixes specified by the landowner, land management agency, or NRCS recommendations. On agricultural lands, seeding would be conducted only as agreed upon with the landowner. Once operation begins, Keystone is required to monitor the pipeline no more frequently than every three weeks. Monitoring would mostly be done from aerial reconnaissance, but also ground inspections. In addition, landowners would be asked to report on areas where seeds may have not germinated or erosion has appeared. Keystone would then dispatch crews to repair and address the issues (see Appendix B, CMRP, Section 4.16, Operations and Maintenance).

Keystone would restore and replace fences where they occur. Keystone would also restrict access to the permanent easement using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles in wooded areas or other previously unfenced areas if requested by the landowner. Pipeline markers would be installed at road and railroad crossings and other locations (as required by 49 CFR 195) to show the pipeline location. Markers would identify the pipeline owner and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also would be installed.

The ROW would be inspected after the first growing season to determine revegetation success and noxious weed control. Eroded areas would be repaired and areas that were unsuccessfully re-established would be revegetated by Keystone or Keystone would compensate the landowner for reseeding. The CMRP (Appendix B) provides information on revegetation and weed control procedures that Keystone would incorporate into the proposed Project.

2.1.10.15 Non-Standard Construction Procedures

In addition to standard pipeline construction methods, special construction techniques would be used where warranted by site-specific conditions. These special techniques would be used when crossing roads, highways, and railroads, steep terrain, unstable soils, waterbodies, wetlands, and residential and commercial areas. These special techniques are described below.

Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads would be in accordance with the requirements of the appropriate road and railroad crossing permits and approvals. In general, all major paved roads, all primary gravel roads, highways, and railroads would be crossed by boring beneath the road or railroad. Boring requires excavating a pit on each side of the feature, placing boring equipment in the pit, and boring a hole under the road at least equal to the pipe diameter. Once the hole is bored, a prefabricated pipe section would be pulled through the borehole. For long crossings, sections can be welded onto the pipe string just before pulling through the borehole. Each boring would be expected to take 1 to 2 days for most roads and railroads and 10 days for long crossings such as interstate or four-lane highways.

Most smaller, unpaved roads and driveways would be crossed using the open-cut method where permitted by local authorities or private owners. Most open-cut road crossings can be finished and the road resurfaced in 1 or 2 days.

Pipeline, Utility, and Other Buried Feature Crossings

Keystone and its pipeline contractors would comply with USDOT regulations, utility agreements, and industry BMPs with respect to utility crossing and separation specifications. One-call notification would be made for all utility crossings so respective utilities are identified accordingly.

Unless otherwise specified in a crossing agreement, the contractor would excavate to allow pipeline installation across the existing utility with a minimum clearance of 12 inches. The clearance would be filled with sandbags or suitable fill material to maintain the clearance. Backfill of the crossing would be compacted in lifts to ensure continuous support of the existing utility.

For some crossings, the utility owner may require their own employees to excavate and expose the facility before the Keystone contractor arrives. In those cases, Keystone would work with owners to complete work to the satisfaction of the owner.

Where the owner of the utility does not require pre-excavation, generally, the pipeline contractor would locate and expose the utility before conducting machine excavation.

Steep Terrain

Additional grading may be required in areas where the proposed pipeline route would cross steep slopes. Steep slopes often need to be graded down to a gentler slope for safe construction equipment operation and to accommodate pipe-bending limitations. In such areas, the slopes would be excavated prior to pipeline installation and reconstructed to a stable condition (see Appendix B, CMRP, Section 7.11, Stabilization and Restoration of Stream Banks and Slopes).

In areas where the pipeline route crosses laterally along the side of a slope, cut-and-fill grading may be required to obtain a safe, flat work terrace. Topsoil would be stripped from the entire ROW and stockpiled prior to cut-and-fill grading on steep terrain. Generally on steep slopes, soil from the high side of the ROW would be excavated and moved to the low side of the ROW to create a safe and level work terrace. After the pipeline is installed, the soil from the low side of the ROW would be returned to the high side, and the slope's contour would be restored as near as practicable to preconstruction condition. Topsoil from the stockpile would be spread over the surface, erosion control features installed, and seeding implemented.

In steep terrain, temporary sediment barriers such as silt fence would be installed during clearing to prevent disturbed soil movement into wetland, waterbody, or other environmentally sensitive areas. Temporary slope breakers consisting of mounded and compacted soil would be installed across the ROW during grading and permanent slope breakers would be installed during cleanup. Following construction, seed would be applied to steep slopes and the ROW would be mulched with hay or non-brittle straw or covered with erosion control fabric. Sediment barriers would be maintained across the ROW until permanent vegetation is established. Additional temporary workspace may be required for storing graded material and/or topsoil during construction (see Appendix B, CMRP, Section 4.5.2, Sediment Barriers, and Section 7.11, Stabilization and Restoration of Stream Banks and Slopes).

Unstable Soils

Construction in unstable soils, such as those within the fragile soils of South Dakota and Nebraska, would be in accordance with measures outlined in the CMRP (Appendix B). Construction in these areas could require extended TWAs. Special construction and mitigation techniques would be applied to areas with high potential for landslides and erosion-prone locations. To facilitate restoration, Keystone could implement measures such as the use of photodegradable mats and livestock controls (see Appendix B, CMRP, Section 4.15.3, Right-of-Way Reclamation).

Waterbody Crossings

There are approximately 1,073 waterbody crossings along the proposed Project route, including 56 perennial streams, 974 intermittent streams, 28 canals, 4 artificial impoundments, and 11 waterbodies identified as either artificial or natural lakes, ponds, or reservoirs. Perennial waterbodies would be crossed using one of four techniques: the open-cut wet method (the preferred method), dry flume method, dry dam-and-pump method, or HDD. Each method is described below. In the final design phase of the proposed Project, qualified personnel would assess waterbody crossings with respect to the potential for channel aggradation or degradation and lateral channel migration. The level of assessment for each crossing would vary based on the qualified design personnel's professional judgment.

The pipeline would be installed as necessary to address any hazards the assessment identifies. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The crossing design also would include the specification of appropriate stabilization and restoration measures. The actual crossing method employed at a perennial stream would depend on permit conditions from USACE and other relevant regulatory agencies, as well as additional conditions that may be imposed by landowners or land managers at the crossing location.

The preferred crossing method would be to use the open-cut crossing method. The open-cut method involves trenching through the waterbody while water continues to flow through the construction work area. Pipe segments for the crossing would be fabricated adjacent to the waterbody. Generally, backhoes operating from one or both banks would excavate the trench within the streambed. In wider rivers, in-stream operation of equipment may be necessary. Temporary bridge access will be used for construction equipment to cross streams. Waterbody crossing construction methods are explained in Appendix B, CMRP, Section 7.4, Waterbody Crossing Methods.

Hard or soft trench plugs would be placed to prevent water flow into the upland portions of the trench. Trench spoil excavated from the streambed generally would be placed at least 10 feet away from the water's edge unless stream width is great enough to require placement in the stream bed. Sediment barriers would be installed where necessary to control sediment and to prevent excavated spoil from entering the water. After the trench is excavated, the prefabricated pipeline segment would be carried, pushed, or pulled across the waterbody and positioned in the trench. When crossing saturated wetlands with flowing waterbodies using the open-cut method, the pipe coating would be covered with reinforced concrete or concrete weights to provide negative buoyancy. The need for weighted pipe would be determined by detailed design and site conditions at the time of construction. The trench would then be backfilled with native material or with imported material if required by applicable permits.

Following backfilling, the banks would be restored and stabilized. Keystone designs the crossing burial depth as well as distance from the existing banks to meet regulatory requirements and future potential stream migration. Routine inspections during operations also require Keystone to check on and maintain PHMSA required burial depth.

The proposed Project would utilize dry flume or dry dam-and-pump methods where technically feasible on environmentally sensitive waterbodies as warranted by resource-specific sensitivities. The flume crossing method involves diverting the water flow across the trenching area through one or more flume pipes placed in the waterbody. The dam-and-pump method is similar to the flume method except that pumps and hoses would be used instead of flumes to move water around the construction work area. In both methods, trenching, pipe installation, and backfilling are done while water flow is maintained for all but a short reach of the waterbody at the actual crossing. Once backfilling is complete, the stream banks are restored and stabilized and the flume or pump hoses are removed.

Keystone plans to use the HDD method for crossing 14 waterbodies that are crossed one time on the proposed Project (Table 2.1-9). The HDD method involves drilling a pilot hole under the waterbody and banks, and then enlarging the hole through successive reaming until the hole is large enough to accommodate a prefabricated pipe segment.

Throughout the process of drilling and enlarging the hole, slurry consisting mainly of water and bentonite clay is circulated to power and lubricate the drilling tools, remove drill cuttings, and provide stability to the drilled holes. Bentonite is a naturally occurring clay that is commonly used in the industry during the drilling process. HDD drilling muds are non-toxic and have been used for decades on many pipeline projects. MSDS sheets can be provided when a contractor is selected and they determine which drilling mud they will use. HDD drilling muds are not the same as well drilling muds and have no toxic constituents added.

Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. The HDD method is used to minimize disturbance to the banks, bed, or water quality of the waterbody being crossed. These measures may include, where possible, the drill head advance pace, down-hole pressures, and adjustments to drilling fluid properties (i.e., density, viscosity).

The proposed minimum depth for HDD pipeline sections is 25 feet below the streambed. During HDD construction, an accidental release of pressurized drilling mud from the borehole, or *frac-out,* could potentially occur. In some instances, the pressurized fluids and drilling lubricants may escape the active bore, migrate through the soils, and come to the surface at or near the construction site. Most leaks of HDD drilling fluids occur near the drill entry and exit locations and are quickly contained and cleaned up.

Frac-outs that may release drilling fluids into aquatic environments are more difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. While the HDD method poses a small risk of frac-out, potential releases would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings that the pipeline contractor prepares prior to construction. These practices include monitoring the directional drill, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.

Waterbodies considered for directional drill include:

- Commercially navigable waterbodies.
- Waterbodies wider than 100 feet.
- Waterbodies with terrain features that prohibit open crossing methods.

- Waterbodies adjacent to features such as roads or railroads that would complicate construction by an open crossing method.
- Sensitive environmental resource areas that could be avoided by HDD.

Keystone proposes to use conventional upland cross-country construction techniques in the event these intermittent waterbodies are dry or have non-moving water at the time of crossing. If an intermittent waterbody is flowing when crossed, Keystone would install the pipeline using the open-cut wet crossing method discussed previously. When crossing waterbodies, Keystone would adhere to the guidelines outlined in Keystone's CMRP (Appendix B) and the requirements of its waterbody crossing permits.

Additional TWAs would be required on both sides of all conventionally-crossed waterbodies to stage construction, fabricate the pipeline, and store materials. These workspaces would be located at least 10 feet away from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Before construction, temporary bridges (e.g., clean fill over culverts, timber mats supported by flumes, railcar flatbeds, or flexi-float apparatus) would be installed across all perennial waterbodies to allow construction equipment to cross (see Appendix B, CMRP, Section 7.3, Vehicle Access and Equipment Crossings). Construction equipment would be required to use the bridges, except the clearing crew, which would be allowed one pass through the waterbodies before the bridges are installed.

Table 2.1-9 Waterbodies and Wetlands Crossed Using the Horizontal Directional Drilling Method

State	County	Approx. MP	Waterbody Name
Montana	Phillips	25.3	Frenchman Creek
	Valley	83.4	Milk River
	McCone	89.6	Missouri River
	Dawson	198.1	Yellowstone River
South Dakota	Harding	295.1	Little Missouri River
	Meade/Pennington	429.9	Cheyenne River
	Haakon	433.6	Bridger Creek
	Haakon	480.8	Ash Creek
	Haakon	486.0	Bad River
	Tripp	541.3	White River
Nebraska	Boyd	618.1	Keya Paha River
	Holt	626.1	Niobrara River
	Antelope	713.3	Elk Horn River
	Nance	761.7	Loup River
	Polk	775.2	Platte River

During clearing, sediment barriers such as silt fence and staked straw bales would be installed and maintained on drainages across the ROW adjacent to waterbodies and within additional TWAs to minimize the potential for sediment runoff. Silt fence and straw bales located across the working side of the ROW would be removed during the day when vehicle traffic is present and would be replaced each night. Alternatively, drivable berms could be installed and maintained across the ROW in lieu of a silt fence.

In general, equipment refueling and lubricating at waterbodies would take place in upland areas that are 100 feet or more from the water. When circumstances dictate that equipment refueling and lubricating would be necessary in or near waterbodies, Keystone would follow its SPCC Plan to address the handling of fuel and other hazardous materials (Appendix D Spill Prevention, Control and Countermeasure (SPCC) Plan and Emergency Response Plan (ERP), and see Appendix B, CMRP, Section 3.0, Spill Prevention and Containment).

After the pipeline is installed beneath the waterbody, restoration would begin. Waterbody banks would be restored to preconstruction contours or to a stable configuration. Appropriate erosion control measures such as rock riprap, gabion baskets (rock enclosed in wire bins), log walls, vegetated geogrids, or willow cuttings would be installed as necessary on steep banks in accordance with permit requirements. More stable banks would be seeded with native grasses and mulched or covered with erosion control fabric. Waterbody banks would be temporarily stabilized within 24 hours of completing in-stream construction. Sediment barriers, such as silt fences, straw bales, or drivable berms would be maintained across the ROW at all waterbody approaches until permanent vegetation is established. Temporary equipment bridges would be removed following construction (see Appendix B, CMRP, Section 7.11, Stabilization and Restoration of Stream Banks and Slopes).

Wetland Crossings

Data from wetland delineation field surveys, aerial photography, and National Wetland Inventory maps were used to identify wetlands crossed by the proposed pipeline. Pipeline construction across wetlands would be similar to typical conventional upland cross-country construction procedures, with several modifications where necessary to reduce the potential for pipeline construction to affect wetland hydrology and soil structure. Directional drilling technique may be considered in certain site-specific wetland conditions due to the presence of special-status plant or wildlife species or other factors and will be determined during the Clean Water Act Section 404 permitting process in consultation with the appropriate USFWS regional staff.

The wetland crossing method used would depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment without equipment mats, construction would occur in a manner similar to conventional upland cross-country construction techniques. Topsoil would be segregated over the trench line. In most saturated soils, topsoil segregation would not be possible. Additional TWAs would be required on both sides of particularly wide saturated wetlands to stage construction, fabricate the pipeline, and store materials. These additional TWAs would be located in upland areas a minimum of 10 feet from the wetland edge. More information is located in the Site-Specific Waterbody Crossing Plans in the September 7, 2012 Environmental Report (exp Energy Services Inc. 2012).

Construction equipment working in saturated wetlands would be limited to that area essential for clearing the ROW, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where there is no reasonable access to the ROW except through wetlands, non-essential equipment would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting.

Vegetation clearing in wetlands would be limited to trees and shrubs, which would be cut flush with the ground surface and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench line to the maximum extent practicable. Trench width would be that required to provide an even safe work area which depends upon topography, soil moisture content, and groundwater levels. Severe topography may require additional disturbance to create an even safe work area. More saturated soils usually require a wider trench in order to maintain a safe ditch and to avoid unstable trench walls. During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained on down slopes adjacent to saturated wetlands and within additional TWAs as necessary to minimize the potential for sediment runoff.

Where wetland soils are saturated or inundated, the pipeline can be installed using the push-pull technique. The push-pull technique involves stringing and welding the pipeline outside the wetland and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. The prefabricated pipeline is installed in the wetland by equipping it with floats and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats are removed and the pipeline sinks into place. Most pipe installed in saturated wetlands would be coated with concrete or installed with set-on weights to provide negative buoyancy. Final locations requiring weighted pipe for negative buoyancy would be determined by detailed design and site conditions at the time of construction.

Because little or no grading would occur in wetlands, restoration of contours would be accomplished during backfilling. Prior to backfilling, trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Topsoil would be replaced to the original ground level leaving no crown over the trench line. In some areas where wetlands overlie rocky soil, the pipe would be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, timber riprap, gravel fill, geotextile fabric, and straw mats would be removed from wetlands following backfilling except in the travel lane to allow continued, but controlled, access through the wetland until construction is complete. Upon construction completion, these materials would be removed.

Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the ROW and disposed of properly.

In wetlands where no standing water is present, the construction ROW would be seeded in accordance with the recommendations of the local soil conservation authorities or land management agency.

Fences and Grazing

Fences would be crossed or paralleled by the construction ROW. Before cutting any fence for pipeline construction, each fence would be braced and secured to prevent the slacking of the fence. To prevent livestock passage, the fence opening would be closed temporarily when construction crews leave the area. If pipeline construction creates gaps in natural barriers used for livestock control, the gaps would be fenced according to the landowner's requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs, would be maintained during construction and repaired to preconstruction conditions or better upon construction completion. For instance, Keystone would restore the land to preconstruction conditions to the extent practicable, but may leave access roads at landowner request.

2.1.10.16 Aboveground Facility Construction Procedures

Construction activities at each of the new pump stations would follow a standard sequence of activities: clearing and grading, installing foundations for the electrical building and support buildings, and erecting the structures to support the pumps and/or associated facilities. A block valve would be installed in the mainline with two side block valves; one to the suction piping of the pumps and one from the discharge piping of the pumps. Construction activities and building materials storage would be confined to the pump station construction sites.

The pump stations sites would be cleared of vegetation and graded as necessary to create a level surface for construction vehicle movement and to prepare the area for the building foundations. Foundations would be constructed for the pumps and buildings and soil would be stripped from the construction footprint.

Each pump station would include one electrical equipment shelter, and a variable frequency drive equipment shelter. The electrical equipment shelter would include electrical systems, communication, and control equipment. The variable frequency drive equipment shelter would house variable frequency drive equipment. The crude oil piping, both aboveground and belowground, would be installed and pressure-tested using methods similar to those used for the main pipeline. After testing is successfully completed, the piping would be tied into the main pipeline. Piping installed below grade would be coated for corrosion protection before backfilling. In addition, a cathodic protection system would protect all below-grade facilities. Before being put into service, pumps, controls, and safety devices would be checked and tested to ensure proper system operation and activation of safety mechanisms.

Where delivery and in-line inspection facilities are co-located with a pump station or the tank farm, the delivery and in-line inspection facilities would be located entirely within the facility. Construction activities would include clearing, grading, trenching, installing piping, erecting buildings, fencing the facilities, cleaning up, and restoring the area. The delivery facilities would operate on locally provided power (Table 2.1-10).

Table 2.1-10 Summary of Power Supply Requirements for the Proposed Project Pump Stations

Pump Station Number	Approximate Milepost	Transformer Size (MVA)	Utility Supply (kV)	Length (miles)	Power Provider
Montana					
PS-09	1.2	20/27/33	115	61.8	Big Flat Electric Cooperative
PS-10	49.3	20/27/33	115	49.1	NorVal Electric Cooperative
PS-11	99	20/27/33	230	0.2	NorVal Electric Cooperative

Pump Station Number	Approximate Milepost	Transformer Size (MVA)	Utility Supply (kV)	Length (miles)	Power Provider
PS-12	151.5	20/27/33	115	3.2	McCone Electric Cooperative
PS-13	203.1	20/27/33	115	15.2	Tongue River Electric Cooperative
PS-14	239.5	20/27/33	115	6.3	Montana-Dakota Utilities Company
South Dakota					
PS-15	288.6	20/27/33	115	24.5	Grand Electric Cooperative
PS-16	337.3	20/27/33	115	40.1	Grand Electric Cooperative
PS-17	391.5	20/27/33	115	10.9	Grand Electric Cooperative
PS-18	444.6	20/27/33	115	25.9	West Central Electric Cooperative
PS-19	500.4	20/27/33	115	20.4	West Central Electric Cooperative
PS-20	550.9	20/27/33	115	17.2	Rosebud Electric Cooperative
PS-21	598.9	20/27/33	115	20.1	Rosebud Electric Cooperative
Nebraska					
PS-22[a]	653.6	20/27/33	115	24	Nebraska Public Power District (NPPD) & Niobrara Valley Electric
PS-23[a]	708.2	20/27/33	115	36	NPPD & Loup valleys Rural PPD
PS-24[a]	765	20/27/33	115	9	NPPD & Southern Power District
PS-25[a]	818.4	20/27/33	69	0.1	NPPD & Perennial PPD
PS-26	875.3	20/27/33	115	0.5	NPPD & Norris PPD
Kansas					
PS-27	49	20/27/33	115	4.6	Clay Center Public Utility
PS-29	144.5	20/27/33	115	8.9	Westar Energy

[a] Pump Station locations for PS-22 through PS-25 have yet to be determined.

MVA = megavolt-amperes (million volt-amperes), kV = kilovolt.

Note: Mile posting for each segment of the proposed Project starts at 0.0 at the northernmost point of each segment and increase in the direction of oil flow.

Intermediate MLV construction would be carried out concurrently with the pipeline construction. Wherever practical, intermediate MLVs would be located near public roads to allow year-round access. If necessary, permanent access roads or approaches would be constructed to each fenced MLV site.

2.1.10.17 Construction Workforce and Schedule

Workforce

Keystone proposes to begin construction of the proposed Project in 2013. The proposed Project is planned to be placed into service in 2015. Keystone anticipates a peak workforce of approximately 5,000 to 6,000 construction personnel. Construction personnel would consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff.

Keystone is planning to build the proposed Project in 10 construction spreads. The spread breakdowns and corresponding base of operations for construction spreads are shown on Table 2.1-6. The spread configuration is subject to adjustment. The construction schedule may affect the final spread configuration which may result in the need for additional but shorter spreads. Construction activity would occur simultaneously on spreads within each phased segment of the proposed Project.

It is anticipated that 500 to 600 construction and inspection personnel would be required for each spread. Each spread would require 6 to 8 months to complete. New pump station construction would require 20 to 30 additional workers at each site. Construction of all pump stations would be completed in 18 to 24 months.

Keystone, through its construction contractors and subcontractors, would attempt to hire temporary construction staff from the local population. Provided qualified personnel are available, approximately 10 to 15 percent (50 to 100 people per spread) may be hired from the local workforce for each spread.

Schedule

As an industry rule-of-thumb, cross-country construction progresses at a rate of approximately 20 completed miles per calendar month per spread, which could be used for scheduling purposes. Based on experience, the construction schedule may be estimated as follows:

- Two to three weeks (14 to 21 calendar days) of work on the ROW before production welding starts. These activities include clearing, grading, stringing, and trenching.
- Production welding, based on an average of 1.25 miles per working day and a 6-day work week (7 calendar days), would be completed at 7.5 miles per week, on average.
- Seven weeks (49 calendar days) of work after completing production welding. These activities include non-destructive testing, field joint coating, lowering-in, tie-ins, backfill, ROW clean-up and restoration, hydrostatic testing, reseeding, and other ROW restoration work.

Using this as a basis for determining the duration of construction activities on the ROW yields the following time requirements for various spread lengths (Table 2.1-11). Construction in areas with greater congestion, higher population, industrial areas, or areas requiring other special construction procedures, may result in a slower rate of progress.

Table 2.1-11 Resulting Cross-Country Construction Times Based on Estimates of Schedule

Spread Length	Pre-welding	Welding Time	Post-welding and Clean-up	Duration
80 miles	21 days	75 days	49 days	145 days (21 weeks)
90 miles	21 days	84 days	49 days	154 days (22 weeks)
100 miles	21 days	94 days	49 days	164 days (24 weeks)
120 miles	21 days	112 days	49 days	182 days (26 weeks)

In addition, about 1 month for contractor mobilization before the work is started and 1 month after the work is finished for contractor demobilization should be factored into the overall construction schedule.

2.1.10.18 Decommissioning

If decommissioning, PHMSA has requirements that apply to decommissioning crude oil pipelines in 49 CFR 195.402(c)(10), 49 CFR 195.59, and 195.402. These regulations require that for hazardous liquid pipelines, the procedural manuals for operations, maintenance, and emergencies must include procedures for abandonment, including safe disconnection from an operating pipeline system, purging of combustibles, and sealing abandoned facilities left in place to minimize safety and environmental hazards (49 CFR 195.402). Further, these regulations require that for each abandoned onshore pipeline facility that crosses over, under, or through a commercially navigable waterway, the last operator of that facility must file a report upon abandonment of that facility. The report must contain all reasonably available information related to the facility, including information in the possession of a third party. The report must contain the location, size, date, method of abandonment, and a certification that the facility has been abandoned in accordance with all applicable laws.

TransCanada (the parent company of Keystone) would adopt operating procedures to address these requirements for the proposed Project as they have for previous pipeline projects including the existing Keystone Pipeline. TransCanada typically does not abandon large-diameter pipelines but generally idles or deactivates pipe as market conditions dictate. This allows a dormant pipeline to be reactivated or converted to another purpose in the future, subject to applicable regulatory approvals. When a pipeline or a segment of a pipeline is idled or deactivated, the pipe generally is purged of its contents, filled with an inert gas, and left in place with warning signage intact. Cathodic Protection would be left functional as would other integrity measures such as periodic inspections under the integrity management plan.

The proposed Project pipeline would traverse approximately 45 miles of federal land under the management and jurisdiction of the BLM; all this federal land is in Montana. The portion of the proposed Project that would cross BLM-administered land would be subject to the following pipeline decommissioning and abandonment requirements stipulated in the BLM ROW grants and permanent easement permits:

- Boundary adjustments in oil and gas would automatically amend the right-of-way to include that portion of the facility no longer contained within the above. In the event of an automatic amendment to this right-of way grant, the prior on-lease/unit conditions of approval of the facility would not be affected even though they would now apply to facilities outside the lease/unit as a result of a boundary adjustment. Rental fees, if appropriate, would be recalculated based on the conditions of this grant and the regulations in effect at the time of an automatic amendment.
- Prior to ROW termination, the holder would contact the authorized officer to arrange a predetermination conference to review the grant termination provisions.

- Prior to ROW termination, the holder would contact the authorized officer to arrange a joint inspection of the ROW. This inspection would be held to agree to an acceptable termination (and rehabilitation) plan. This plan would include, but would not be limited to, removal of facilities, drainage structures, or surface material, recontouring, topsoiling, or seeding. The authorized officer would approve the plan in writing prior to the holder's commencement of any termination activities.

The ROW grant on federal lands under the management of BLM for the proposed Project would have a maximum term not-to-exceed 30 years. For the proposed Project to extend beyond 30 years, the approved ROW grant would require a renewal authorization-certification decision by BLM. While there are no state regulations applicable to pipeline decommissioning in Montana, South Dakota, or Nebraska, environmental specifications developed by Montana Department of Environmental Quality that would address restoration of areas disturbed during abandonment would be required.

Decommissioning activities would be conducted consistent with all applicable regulatory requirements in place at the time of decommissioning. Since regulations at the federal, state, and local level change over time, it would be highly speculative to estimate what regulatory framework would apply to the proposed Project decommissioning at the end of the useful life of the proposed Project more than 50 years in the future.

Prior to decommissioning the proposed Project, Keystone would identify the decommissioning procedures it would use along each portion of the route, identify the regulations it would be required to comply with, and submit applications for the appropriate environmental permits. At that point, Keystone and the issuing agencies would address the environmental impacts of implementing the decommissioning procedures and identify the mitigation measures required to avoid or minimize impacts.

After decommissioning there would likely be fewer land use restrictions than during operation of the proposed Project since either the ROW would no longer have strict encroachment limitations for protecting the purged pipeline, or the pipeline may have been removed and there would no longer be use limitations of the former ROW.

As noted above, PHMSA regulations require that hazardous liquids pipelines be purged of combustibles prior to decommissioning. Therefore the potential for contaminants release from the decommissioned pipeline would be negligible.

2.1.11 Operation and Maintenance

The proposed Project's facilities would be maintained in accordance with 49 CFR 194, 49 CFR 195, the Project-specific Special Conditions recommended by PHMSA and agreed to by Keystone, and other applicable state and federal regulations. In most cases Keystone personnel would operate and maintain the pipeline system. The permanent operational pipeline workforce is estimated at about 20 United States employees.

Keystone would implement an annual Pipeline Maintenance Program to ensure pipeline integrity. The Pipeline Maintenance Program would include valve maintenance, periodic inline inspections, and cathodic protection readings underpinned by a company-wide goal to ensure facilities are reliable and in service. Data collected in each year of the program would be fed back into the decision-making process for developing the following year's program. In addition, the pipeline would be monitored 24 hours per day, 365 days per year from the Operations

Control Center (OCC) using leak detection systems and supervisory control and data acquisition (SCADA). During operations, Keystone would have a Project-specific Emergency Response Plan (ERP) in place to manage a variety of events.

2.1.11.1 Normal Operations and Routine Maintenance

Keystone considers that this BA covers the following routine maintenance: periodic ROW mowing in non-agricultural areas, ROW tree clearing, aerial and ground patrols of the ROW, periodic inspections of operating equipment on the ROW (e.g., MLVs, pump stations), and potential excavation of the proposed pipeline within the first 6 months to 2 years for coating and other inspections.

If Keystone would need to repair or replace a portion of the proposed pipeline or replace aboveground facilities in the ROW, Keystone would consult with agencies prior to initiating that maintenance work. If an emergency or spill from the proposed pipeline occurs, Keystone would respond to the spill or emergency and then address any impacts. Impacts would usually be covered under a Natural Resource Damage Assessment conducted by the United States Environmental Protection Agency (USEPA).

The pipeline would be inspected periodically via aerial surveillance, as well as limited ground surveillance as operating conditions permit, at a frequency consistent with the requirements of 49 CFR 195 and the Project-specific special conditions. These surveillance activities would provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that may affect the safety and operation of the pipeline. Evidence of population changes would be monitored and High Consequence Areas identified as necessary. Intermediate MLVs and MLVs would be inspected twice annually and the results documented.

To maintain permanent easement accessibility and to accommodate pipeline integrity surveys, woody vegetation along the pipeline permanent easement would be periodically cleared. Cultivated crops would be allowed to grow in the permanent easement. Trees would be removed from the permanent easement. Keystone would use mechanical mowing or cutting along its permanent easement for normal vegetation maintenance. Trees along the paths of areas where the pipe was installed via HDDs would only be cleared as required on a site-specific basis.

The ROW would be monitored to identify any areas where soil productivity has been degraded as a result of pipeline construction, and restoration measures would be implemented to rectify any such concerns. Applicable restoration measures are outlined in the CMRP (Appendix B).

Multiple overlapping and redundant pipeline integrity systems would be implemented, including a Quality Assurance program for pipe manufacture and pipe coating, fusion-bonded epoxy coating, cathodic protection, non-destructive testing of 100 percent of the girth welds, hydrostatic testing to 125 percent of the maximum operating pressure (MOP), periodic internal cleaning and high-resolution in-line inspection, depth of cover exceeding federal standards, periodic aerial surveillance, public awareness program, SCADA system, and an OCC (with complete redundant backup) providing monitoring of the pipeline every 5 seconds, 24 hours a day, every day of the year.

SCADA facilities would be located at all pump station, remotely-operated MLV, and delivery facilities. The pipeline SCADA system would allow the control center to perform the following functions:

- Remotely read automated MLV positions.
- Remotely start and stop at pump stations.
- Remotely read tank levels.
- Remotely close and open automated MLVs.
- Remotely read line pressure and temperature at all automated intermediate valve sites, at all pump stations, and at delivery metering facilities.
- Remotely read delivery flow and total flow.

The proposed Project would have an OCC staffed by an experienced and highly trained crew 24 hours per day every day of the year. A fully-redundant backup OCC would be available as needed.

Real time information communication systems, including backup systems, would provide up-to-date information from the pump stations to the OCC plus the ability to contact field personnel. The OCC would have highly sophisticated pipeline monitoring systems and multiple leak detection systems as discussed in Section 2.1.11.2, Normal Operations and Routine Maintenance.

2.1.11.2 Operations

Preparing manuals and procedures for responding to abnormal operations complies with the Code of Federal Regulations, including 49 CFR 195.402. Section 195.402(a) requires a pipeline operator to prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies. Section 195.402(d) (Abnormal Operation) requires the manual to include procedures to provide safety when operating design limits have been exceeded.

SCADA and Leak Detection

Keystone proposes to utilize a SCADA system to remotely monitor and control the pipeline system. Keystone's SCADA system would include the following highlights:

- Redundant fully functional backup system available for service at all times.
- Automatic features installed as integral components within the SCADA system to ensure operation within prescribed pressure limits.
- Additional automatic features installed at the local pump station level to provide pipeline pressure protection in the event communications with the SCADA host are interrupted.
- Pipeline monitoring every 5 seconds, 24 hours a day, every day of the year.

Keystone also would have a number of complimentary leak detection methods and systems available within the OCC. These methods and systems are overlapping in nature and progress in leak detection thresholds. Leak detection includes the following methods:

- OCC operator remote monitoring which consists primarily of monitoring pressure and flow data received from pump stations and valve sites fed back to the OCC by the Keystone SCADA system. Remote monitoring is typically able to detect leaks down to approximately 25 to 30 percent of pipeline flow rate.

- Software-based volume balance systems that monitor receipt and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of pipeline flow rate.
- Computational pipeline monitoring or model-based leak detection systems that divide the pipeline system into smaller segments and monitor each of these segments on a mass balance basis. These systems are typically capable of detecting leaks down to a level approximately 1.5 to 2 percent of pipeline flow rate.
- Computer-based, non-real time, accumulated gain/loss volume trending to assist in identifying low rate or seepage releases below the 1.5 to 2 percent by volume detection thresholds.
- Direct observation methods, which include aerial patrols, ground patrols, and public and landowner awareness programs designed to encourage and facilitate reporting of suspected leaks and events that may suggest a threat to pipeline integrity.

Emergency Response Procedures

A Project-specific ERP would be prepared for the proposed Project, which would be submitted to the Pipeline Hazardous Material Safety Administration (PHMSA) for approval prior to commencing system operations. A comprehensive ERP for the existing Keystone Pipeline Project has been reviewed and approved by PHMSA. The publicly-available portion of the Keystone Oil Pipeline System ERP is included as Appendix D (Spill Prevention, Control and Countermeasure (SPCC) Plan and Emergency Response Plan (ERP)) (parts of the ERP and the Pipeline Spill Response Plan [PSRP] are considered confidential by PHMSA and the U.S. Department of Homeland Security). As described in Section 4.14, Potential Releases, of the Supplemental EIS, the existing Keystone Oil Pipeline Project documents would be used as templates for the plans for the proposed Project. Project-specific information would be inserted into the plans as it becomes available.

In addition, response equipment would be procured and strategically positioned along the route, staff would be trained in spill response and the Incident Command System, and emergency services and public officials would be educated on all aspects of the proposed Project and what their roles would be if an accidental leak were to occur. If a spill were to occur, Keystone and its contractors would be responsible for recovery and cleanup. PHMSA would require a certification from Keystone that necessary emergency response equipment is available in the event of an unplanned spill prior to providing Keystone with an authorization to begin operating the proposed Project.

The specific locations of Keystone's emergency responders and equipment would be determined upon conclusion of the pipeline detailed design and described in the PSRP and ERP. Company emergency responders would be placed consistent with industry practice and with applicable regulations, including 49 CFR Parts 194 and 195. The response time to transfer additional resources to a potential leak site would follow an escalating tier system, with initial emergency responders capable of reaching all locations within 6 hours in the event of a spill for high volume areas; the spill response for all other areas is 12 hours. Typically, Keystone's emergency responders would be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings.
- Populated and urbanized areas.

- Unusually sensitive areas, including drinking water locations, ecological, historical, and archaeological resources.

The following types of emergency response equipment would be situated along the pipeline route:

- Pick-up trucks, one-ton trucks and vans
- Vacuum trucks
- Work and safety boats
- Containment boom
- Skimmers
- Pumps, hoses, fittings and valves
- Generators and extension cords
- Air compressors
- Floodlights
- Wind socks
- Signage
- Air horns
- Flashlights
- Megaphones
- Fluorescent safety vests
- Communications equipment including cell phones, two way radios, and satellite phones
- Containment tanks and rubber bladders
- Expendable supplies including absorbent booms and pads
- Assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws
- Ropes, chains, screw anchors, clevis pins and other boom connection devices
- Personal protective equipment including rubber gloves, chest and hip waders and airborne contaminant detection equipment

Emergency response equipment would be maintained and tested in accordance with manufacturer's recommendations. These materials would be stored in a trailer; the locations would be determined once the system design is complete and the risk analysis finalized. Additional equipment, including helicopters, fixed-wing aircraft, all-terrain vehicles, snowmobiles, backhoes, dump trucks, watercraft, bulldozers, and front-end loaders could also be accessed depending upon site-specific circumstances. Other types, numbers, and locations of equipment would be determined upon conclusion of the pipeline detailed design and the completion of the PSRP and the ERP for the proposed Project.

Several federal regulations define the notification requirements and response actions in the case of an accidental release, including the 40 CFR Part 300 (National Oil and Hazardous Substances Pollution Contingency Plan), the Clean Water Act, and Oil Pollution Act of 1990. In the event of a suspected leak or if a spill is reported to the OCC, after verification the operators would perform an emergency pipeline shutdown. Details on the type of verification to be used, what conditions get reported, and what release magnitude would trigger a shutdown are provided in Appendix D (SPCC Plan and ERP).

The emergency shutdown would involve stopping all operating pumping units at all pump stations. The on-call response designate would respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel could elect to dispatch other resources as soon as practical. Response efforts would first be directed to preventing or limiting any further contamination of the waterway, once any concerns with respect to health and safety of the responders have been addressed. Other procedures would include immediate dispatch of a first responder to verify the release and secure the site. Simultaneously, an Incident Command System would be implemented and internal and external notifications would take place.

The National Response Center (NRC) would be notified immediately in the event of a release of crude oil that violates water quality standards, creates a sheen on water, or causes a sludge or emulsion to be deposited beneath the water surface or upon adjoining shorelines (40 CFR 112). In addition to the NRC, timely notifications would also be made to other agencies, including the appropriate local emergency planning committee, sheriff's department, the appropriate state agency, the USEPA, and affected landowners. Keystone must provide immediate notification of all reportable incidents in accordance with 49 CFR Part 195, and must notify the appropriate PHMSA regional office within 24 hours of any non-reportable leaks occurring on the pipeline.

Under the National Contingency Plan, the USEPA is the lead federal response agency for oil spills occurring on land and in inland waters. The USEPA would evaluate the size and nature of a spill, its potential hazards, the resources needed to contain and clean it up, and the ability of the responsible party or local authorities to handle the incident. The USEPA would monitor all activities to ensure that the spill is being contained and cleaned up appropriately. All spills meeting legally defined criteria (see criteria above per 40 CFR 112) must be monitored by the USEPA, even though most spills are small and cleaned up by the responsible party. In the unlikely event of a large spill, Keystone and its contractors would be responsible for recovery and cleanup. The usual role of local emergency responders is to notify community members, direct people away from the hazard area, and address potential impacts to the community such as temporary road closings.

Remediation

Corrective remedial actions would be dictated by federal regulations and enforced by the USEPA, and in some specific situations, the U.S. Coast Guard, PHMSA, and the appropriate state agencies. Required remedial actions may range from the excavation and removal of contaminated soil to allowing the contaminated soil to recover through natural environmental fate processes (e.g., evaporation, biodegradation). Decisions concerning remedial methods and cleanup extent would account for state-mandated remedial cleanup levels, potential effects to sensitive receptors, volume and extent of the contamination, potential violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities.

In the event of a spill, several federal regulations define the notification requirements and response actions, including the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300), the Clean Water Act, and the Oil Pollution Act. At the most fundamental level, these interlocking programs mandate notification and initiation of response actions in a timeframe and on a scale commensurate with the threats posed. The appropriate remedial measures would be implemented to meet federal and state standards designed to ensure protection of human health and environmental quality.

2.2 CUMULATIVE IMPACTS

A cumulative effects assessment (CEA) considers the residual impacts of the proposed Project in combination with the residual impacts from the connected actions and actions from other "past, present, and reasonably foreseeable future" projects, as outlined in the Council on Environmental Quality (CEQ) guidance on Considering Cumulative Effects under NEPA. Cumulative effects, by definition, are residual in nature because they occur, or continue to occur, long after project construction is completed. In the Final EIS, the cumulative effects assessment focused on existing, under-construction, and planned linear energy transportation systems including natural gas pipelines, crude oil pipelines, and electric transmission lines; water delivery projects; and a number of energy development projects.

The CEA presented in the Supplemental EIS seeks to focus the list of projects from the Final EIS as they pertain to the proposed Project, and broaden the scope of past, present, and reasonably foreseeable future projects under consideration to include non-linear projects and other development activities with the potential to contribute to overall cumulative effects within the Project area. In addition, the Final EIS focused on projects that geographically intersected with the proposed Project; the Supplemental EIS CEA broadens the geographic boundary of the projects and activities considered to have the potential to contribute to cumulative effects. This broader perspective is provided to supplement the analysis provided in the Final EIS to support decision-making. Within this context, although geographically widely separated, the CEA also considers the potential for impacts associated with the proposed Project in combination with the TransCanada Gulf Coast Pipeline, construction which began in August 2012. This was done in response to public comment received on the scope of work for the Supplemental EIS, which indicated a concern that impacts from both projects (proposed Project plus the Gulf Coast Pipeline) would be additive, because when completed, they would be part of one larger system of crude oil transportation pipelines.

As a matter of the Department's policy, extraterritorial considerations related to the Canadian portion of the proposed Project are evaluated in the Supplemental EIS, Section 4.15.4, Extraterritorial Concerns, to the extent that the proposed Project would contribute to cumulative environmental impacts within Canada.

Although rare in occurrence, it is possible that accidental or emergency events may arise due to an unforeseen chain of events during the proposed Project's operational life. For an assessment of the potential short- and long-term effects of oil releases to the environment, see Supplemental EIS, Section 4.14, Potential Releases; for a discussion of potential cumulative effects of oil releases to the environment, see Supplemental EIS, Section 4.15.3.13, Potential Releases.

It should be noted that beneficial impacts are not addressed in the CEA. While potential beneficial impacts of proposed pipeline construction could occur in the form of increased tax revenues, the focus of the CEA is on potential adverse effects that may result from the proposed project on resources, ecosystems, and human communities. In addition, ancillary facilities in North Dakota and Kansas are not included in the CEA since the activities in these states would occur on previously developed/disturbed lands and/or are geographically small areas of potential impact relative to the proposed Project. Therefore, these facilities would have negligible contributions to overall cumulative effects.

2.2.1 Methods and Scope of the Cumulative Impacts Analysis

In general, the analysis of cumulative impacts in the CEA follows the processes recommended by CEQ (1997 and 2005) and the regulations at 40 CFR 1508.7. The scope of the CEA is governed by the geographic and temporal boundaries that correlate to the resources impacted by the proposed Project, and how the proposed Project intersects with connected actions and other projects across these resources. In general, the geographic limits of the area evaluated in the CEA can be organized into three categories:

- Project Area (PA)—Defined as the area of physical disturbance associated with the proposed Project limits; that is, in and along the pipeline ROW construction corridor and its ancillary facilities, e.g., access roads, pump stations, and construction camps.
- Local Area (LA)[5]—Defined as a 2-mile distance on either side of the proposed pipeline ROW corridor and its ancillary facilities.
- Regional (R)—Defined by the potentially impacted resource, e.g., home range of a wildlife species, bird migration corridor, or a regional airshed.

Activities within what is termed the Project Cumulative Impact Corridor (PCIC) indicate geographic proximity to the proposed Project (e.g., PA or LA as noted above). The temporal boundaries for this analysis reflect the nature and timing of the proposed Project activities as they relate to knowledge of past and present projects, and the availability of information on future projects that have a high probability of proceeding. For any given project, the duration of potential impacts is typically categorized as temporary, short-term, long-term, or permanent.

Temporary impacts are generally expected to occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts are defined as those that would continue for approximately 3 years following construction. Long-term impacts are those where the resource would require greater than 3 years to recover. Permanent impacts occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions during the design life of the proposed Project (50 years), such as with construction of aboveground structures.

When considering the broad scope of evaluating the combined effects of past, present, and reasonably foreseeable future projects, it is the long-term and permanent impacts of individual projects that would have the greatest potential to combine with one another to create significant cumulative impacts. Therefore, the primary focus of this CEA is to gain an understanding of the potential combined long-term or permanent impacts to resources, ecosystems, and human communities from the proposed Project, connected actions and other past, present, and reasonably foreseeable future projects (federal, non-federal, and private actions). Temporary and/or short-term impacts, which could occur concurrently (geographically and temporally) between the proposed Project, connected actions, and other projects to produce short term cumulative impacts, are considered qualitatively.

Key factors in controlling the temporal scale of cumulative effects are several measures designed to mitigate, offset, and/or restore impacted resources to pre-construction conditions. Keystone's CMRP (see Appendix B, CMRP) recommended additional mitigations, individual federal and state agency permitting conditions, and/or existing laws and regulations that all function to control potential impacts and reduce long-term and permanent effects. Therefore, the CEA incorporates the implementation of these measures in the evaluation of anticipated resource impacts, specifically as they affect the duration of impacts and their potential to contribute

[5] Correlates to the socioeconomic analysis area as defined in Supplemental EIS Section 3.10, Socioeconomics.

significantly to cumulative effects. The attribution of significance requires the assessment and integration of a number of lines of evidence:

- The effectiveness of mitigation measures or other embedded controls.
- The geographic context of where the activities are taking place (e.g., pristine land versus previously disturbed areas).
- The degree to which residual impacts on a local scale are additive with similar impacts from other projects and activities, and their magnitude (i.e., relative contribution).

This analysis is enhanced through the use of GIS mapping, which is presented where applicable.

The sections of the CEA are organized as follows:

- Section 2.2.2, Past, Present, and Reasonably Foreseeable Projects: This section evaluates reasonably identifiable federal, state, local, and private projects and/or development activities based on publicly available information with possible effects that could be temporally and/or geographically coincident with those of the proposed Project on Federally Protected and Candidate Species Cumulative Impacts. The discussion in this section is organized by the project/activity timeframe: past, present or future, with an accompanying table listing the identified project/activity. Connected actions to the proposed Project are presented separately following the other future project/activity descriptions.
- Section 2.2.3, Federally Protected and Candidate Species Cumulative Impacts: This section discusses the potential cumulative impacts of the proposed Project and other actions on Federally Protected and Candidate Species Cumulative Impacts, along with any pertinent mitigation actions, and how these anticipated cumulative impacts interact with the other past, present, and reasonably foreseeable future projects/activities described in Section 2.2.2.

2.2.2 Past, Present, and Reasonably Foreseeable Projects

The proposed Project would occur in locations that include numerous existing, under-construction, and planned major capital public and private projects, including oil and gas well fields, major product pipelines, water distribution lines, energy development projects (including wind farms) and associated electric transmission lines, and mining projects. The identification of the projects and/or activities to be included in the cumulative impact analysis was accomplished through independent research, beginning with review of the PHMSA National Pipeline Mapping System (https://www.npms.phmsa.dot.gov/). This was followed by queries of the Montana, South Dakota, and Nebraska state government websites, and private company websites providing publicly available data and details on projects and activities within the geographic boundaries of interest. Please see Appendix E (Past, Present, and Reasonably Foreseeable Future Project Descriptions) for a more detailed description of the projects identified, as well as a complete list of the data sources accessed for the CEA.

Past projects and activities considered in the CEA are those that have been completed and their physical features are part of the current/existing landscape. Residual (i.e., permanent) effects from these projects/activities are considered to be potentially cumulative with the effects of the proposed Project. These projects are further described in Table 2.2-1. Unless otherwise noted, it is assumed the impacts of these projects are reflected in existing environmental conditions as described in the Supplemental EIS Chapter 3, Affected Environment.

Table 2.2-1 Representative Past Projects Considered in the Cumulative Effects Assessment

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Crude Oil Pipelines and Storage Facilities			
Express-Platte Pipeline System	Two pipelines: the Express has been in operation since 1997, the Platte since 1952. Approximately 1,700 miles total of crude oil pipelines that are 20 (Platte) and 24 (Express) inches in diameter.	Southeastern Alberta; central Montana; northeastern Wyoming; south-central Nebraska; northeastern Kansas; north-central Missouri.	The Express-Platte system would be within the PCIC for the proposed Project near Steele City, Nebraska.
Keystone Mainline Oil Pipeline	Approximately 1,379-mile-long crude oil pipeline has a design capacity between 435,000 barrels per day (bpd) to 591,000 bpd.	Southeastern Alberta; southern Saskatchewan; southwestern Manitoba; eastern North Dakota; eastern South Dakota; eastern Nebraska; northeastern Kansas; central Missouri; central Illinois.	The Keystone Mainline Oil Pipeline would be within the PCIC near Steele City, Jefferson County, Nebraska.
Keystone Cushing Extension	298-mile-long, 36-inch-diameter crude oil pipeline from Steele City, Nebraska, to Cushing, Oklahoma.	Southern Nebraska; central Kansas; central Oklahoma.	The northern portion of the Cushing Extension would be within the PCIC in Steele City, Jefferson County, Nebraska.
True Company Pipelines and Crude Oil Storage Facility	A system of more than 3,400 miles of crude oil gathering and transportation pipelines, including Bridger Pipeline, LLC that owns and operates the Poplar, Little Missouri, Powder River, Butte, Belle Fourche, Four Bears, Parshall, and Bridger pipeline systems. Three collector pipelines to transport production from the north, west, and east into the Butte Pipeline near Baker are under construction.	Throughout Wyoming; eastern Montana; western and central North Dakota.	Portions of the pipeline systems owned and operated by True Companies would be within the PCIC in near Baker, Fallon County, Montana.
Refined/Finished Product Pipelines			
Cenex Pipeline	8-inch products pipeline running from Fargo, North Dakota, at Williams Pipeline Terminal to Laurel Station at the Cenex Refinery in Montana.	Western North Dakota and eastern Montana.	Within PCIC in southwestern Dawson County, Montana.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Magellan Pipeline	Total of 9,600 miles of refined product pipelines, including 50 terminals (four in Nebraska) and seven storage facilities.	The Magellan Pipeline system is located in the following states: North Dakota, Minnesota, South Dakota, Nebraska, Colorado, Iowa, Illinois, Missouri, Kansas, Oklahoma, Arkansas, and Texas.	Magellan Pipeline crosses the PCIC in southern York County, Nebraska.
NuStar Pipeline	Central East Region—East Refined Products Pipeline system transports refined petroleum products, including gasoline, diesel, and propane. The system includes 2,530 miles of pipelines that transport an average of 203,000 bpd and 21 distribution terminals (five in Nebraska, five in South Dakota) with a storage capacity of 4.8 million barrels.	Pipeline system runs north-south from central North Dakota to eastern South Dakota, western Iowa, eastern Nebraska, southern Nebraska, central Kansas.	NuStar Pipeline is within the PCIC in Fillmore and York counties, Nebraska.
Natural Gas Pipelines			
Williston Basin Interstate Pipeline Company System	A 3,364-mile-long natural gas pipeline transmission system.	Pipeline system runs through Montana, North Dakota, Wyoming, and South Dakota.	Portions of the Williston Basin System would be within the PCIC in Valley and Fallon counties, Montana and Harding County, South Dakota.
Northern Border Pipeline	A 1,249-mile-long interstate natural gas pipeline with a design capacity of approximately 2.4 billion cubic feet of gas per day (bcf/d).	Pipeline runs generally northwest to southeast through Montana, North Dakota, South Dakota, Minnesota, Iowa, Illinois, and Indiana.	Portions of the Northern Border Pipeline would be in the PCIC in Phillips and Valley counties, Montana, and would be near and parallel to the proposed Project for approximately 21.5 miles.
Northern Natural Gas	14,900 miles of pipeline, operational since 1930, 2- to 36-inch diameter. 2,357 receipt and delivery points.	Minnesota, Wisconsin, Michigan, Iowa, South Dakota, Nebraska, Kansas, Oklahoma, Texas, and New Mexico.	The Northern Natural Gas Pipeline system is within the PCIC in Jefferson and Saline counties, Nebraska.
Rockies Express West (REX-W)	A 713-mile-long 42-inch-diameter interstate natural gas transmission pipeline with a capacity of approximately 1.5 bcf/d. The project includes five compressor stations.	Colorado, Wyoming, southern Nebraska, northeastern Kansas, Missouri, Illinois, Indiana, and Ohio.	REX-W is within the PCIC in a generally west-to-east direction in the vicinity of Steele City, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Bison Natural Gas Pipeline	A 302-mile-long, 30-inch-diameter pipeline with a capacity of 500 million cubic feet per day (MMcf/d). Pipeline system and related facilities that extend northeastward from the Dead Horse Region near Gillette, Wyoming, through southeastern Montana and southwestern North Dakota where the system connects with the Northern Border Pipeline system near Northern Border's Compressor Station No. 6 in Morton County, North Dakota. 407 MMcf/d capacity currently; with compression (approved but not yet built) capacity will be approx. 477 MMcf/d , with potential expandability to approx. 1 bcf/d.	Southwestern North Dakota, southeastern Montana, and northeastern Wyoming.	The Bison pipeline intersects the PCIC in southern Fallon County, Montana.
Kinder-Morgan Interstate Gas Transmissi on (KMIGT)	Approximately 5,100 miles of transmission lines in Colorado, Kansas, Nebraska, Michigan, and Wyoming. The Huntsman natural gas storage facility, located in Cheyenne County, Nebraska, with approx. 10 billion cubic feet of firm capacity commitments is also part of the system.	Transmission system comprised of West zone (central Wyoming); Central zone (southeastern Wyoming, southwestern Nebraska, and northeastern Colorado); East-North zone (southern and eastern Nebraska); and East-South zone (northwestern Kansas).	KMIGT within the PCIC in the following counties: northern Fillmore County, Nebraska; central York County, Nebraska; eastern Boone County, Nebraska; eastern Antelope County, Nebraska; and northern Holt County, Nebraska.
Trailblazer Pipeline	436 miles of 36-inch pipe. Certificated capacity of 522,000 decatherms/day (Dth/day). Expansion planned: Expand by 324,000 Dth/day to bring total capacity to 846,000 Dth/day.	Runs generally east-west from Cheyenne, Wyoming along the Wyoming/Colorado border through southern Nebraska.	Trailblazer Pipeline crosses the PCIC in southern Saline County, Nebraska.
Natural Gas Pipeline Co. of America—Amarillo Line	Total network: 10,000+ miles of pipelines, 265 billion cubic feet of working gas storage capacity. Amarillo Line (based on 2002 stats) produces 1.6 bcf/d.	Runs generally northeast to southwest from Chicago, Illinois through southern Iowa, across southeast Nebraska (at Steele City), central Kansas, western and southern Oklahoma, northwestern Texas, and southeastern New Mexico.	NGPL line is within the PCIC at Steele City, Jefferson County, Nebraska.
Central City Gas System	Natural gas pipeline system owned and operated by the city of Central City, Nebraska. 2- to 6-inch-diameter transmission line.	Serves Central City, Nebraska.	Central City Gas Pipeline system is within the PCIC in southwestern Polk County, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
SourceGas LLC	SourceGas—Nebraska transmission system consists of approximately 5,000 miles of transmission and distribution pipeline in 57 counties across Nebraska. The system has interconnections with or laterals off the KMIGT, Pony Express, and Trailblazer pipelines.	Serves the western 2/3 of Nebraska.	SourceGas pipelines within the PCIC in northwestern Holt County, Nebraska and southeastern Boone County, Nebraska.
Ammonia Pipelines			
NuStar Pipeline	2,000 miles total, ranging from 4- to 10-inch carrying anhydrous ammonia, with a terminal at Aurora, Nebraska	Pipeline extends through Indiana, Illinois, Missouri, Arkansas, Louisiana, and Nebraska. Specific cities impacted in Nebraska: Blair, Fremont, and Aurora.	Anhydrous ammonia pipeline is within the PCIC in northwestern York County, Nebraska.
Water Delivery Systems			
Perkins County Rural Water System	Extension of Southwest Pipeline from Lake Sakakawea, North Dakota.	Map of pipeline or system area not readily available; however, project is in Perkins County, South Dakota.	Project route is through southwestern Perkins County, South Dakota. Water pipeline possibly within the PCIC depending on location.
Electrical Transmission Lines			
345-499-kV Transmission Lines	The U.S. electric grid consists of independently owned and operated power plants and transmission lines.	The transmission lines affect the entire United States.	Transmission lines would affect the PCIC in Boyd, Antelope, Boone, Holt, Nance, Merrick, Hamilton, York, Fillmore, and Jefferson counties in Nebraska. The PCIC would also be affected in Fallon and McCone counties in Montana. In South Dakota, the PCIC is affected in Perkins, Meade, Haakon, and Jones counties.
Railroads			
Union Pacific Railroad (UP)	The UP spans 31,900 miles and is the largest railroad network in the United States.	The UP operates in 23 states throughout the central and western United States.	Rail is within the PCIC in Jefferson and Merrick counties, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Burlington Northern Santa Fe Railway (BNSF)	BNSF owns rail lines running through multiple areas of Montana, primarily east-west along the northern border; northwest to southeast across the central portion of the state; and southwest to northeast in the southeastern portion of the state. BNSF-owned lines also run generally northwest to southeast across Nebraska, with heavier rail line concentration around Lincoln.	The BNSF railway operates throughout the central and western United States.	The railway falls within the PCIC in Fillmore and York counties, Nebraska and the following counties in Montana: Baker, Prairie, Dawson, and McCone.
Nebraska Central Railroad Company (NCRC)	The NCRC operates over 340 miles of track on three lines concentrated northwest of Lincoln.	The NCRC operates in northeastern and central Nebraska.	Rail is within the PCIC in Polk, Nance, and Boone counties, Nebraska.
Nebraska Northeastern Railway Company (NNRC)	The NNRC operates on approximately 120 miles of northeastern Nebraska. Runs generally east-west across northeastern Nebraska from the Missouri River to O'Neill, Nebraska.	The NNRC operates in northeastern Nebraska.	Rail is within the PCIC in Antelope County, Nebraska.
Canadian Pacific/ Dakota, Minnesota & Eastern	A 574-mile line that runs north-south along the western South Dakota border and east-west through central South Dakota.	Western and central South Dakota.	Rail is within the PCIC in Haakon County, South Dakota.
South Dakota Owned/ Dakota Southern Operated	A 190-mile line that runs generally east-west across south-central South Dakota.	South-central South Dakota.	Within the PCIC in Jones and Valley counties, South Dakota.
Wind Farms			
Diamond Willow Windfarm	Operated by Montana-Dakota Utilities (MDU). The first phase began commercial operation in 2008. Expanded in 2010, for a total capacity of 30 megawatts (MW), by 20 General Electric 1.5 MW turbines.	South of Baker, Montana in Fallon County.	Potentially within the PCIC in Fallon County (Baker), Montana.
Laredo Ridge	7,600 acre site. Approximately 3 miles northeast of Petersburg, Nebraska, in Boone County, Nebraska. 81 MW capacity.	North of Petersburg, Nebraska, in northern Boone County, Nebraska.	Possibly within the PCIC in Boone County, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Landfills			
City of Baker	Closed landfill, located approximately 2 miles southwest of the city of Baker, Montana.	Baker, Fallon County, Montana.	Closed landfill is within the PCIC near Baker, Fallon County, Montana.
Town of Nashua	Closed Class III Landfill located approximately 2 miles west of the town of Nashua, Montana.	Nashua, Valley County, Montana.	Closed landfill is within the PCIC near Nashua, Valley County, Montana.
City of O'Neill	Waste disposal area for construction and demolition debris, generally described as the SE 1/4 Nebraska 1/4 Section 29 Township 29 North Range 11 West of the 6th Principal Meridian, located in the City of O'Neill, Nebraska.	O'Neill, Holt County, Nebraska.	Landfill is potentially within the PCIC.
Power Plants			
Nebraska Public Power District (NPPD) Petroleum Plant	The NPPD operates a Mobile Petroleum Plant within York, Nebraska. This plant provides a maximum of 3.1 MW of electricity generated from petroleum to the surrounding residential and industrial facilities.	York, Nebraska.	Within the PCIC in York, Nebraska.
Grazing Land			
Montana Grazing Lands	The state of Montana has extensive lands used by ranchers for the grazing of herds of animals.	Multiple	Grazing lands would fall within the PCIC in Valley, McCone, Dawson, Prairie, and Fallon counties.
South Dakota Grazing Lands	The use of lands for grazing herds of animals is widespread in the state of South Dakota.	Multiple	The PCIC would be affected by grazing lands in Harding, Butte, Perkins, Meade, Haakon, Jones, and Tripp counties.
Nebraska Grazing Lands	The state of Nebraska has extensive lands used by ranchers for grazing herds of animals.	Multiple	Grazing lands would fall within the PCIC in Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, York, Fillmore, Saline, and Jefferson counties.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Oil and Gas Storage Facilities			
Baker Facility	Natural gas storage facility in Baker, Fallon County, Montana. Owned and operated by Williston Basin Interstate Pipeline Company, with a total capacity of 287.2 billion cubic feet.	Baker, Fallon County, Montana.	Baker natural gas storage facility is within the PCIC near Baker, Fallon County, Montana.
Oil and Gas Well Fields			
Wildcat and Buffalo	Oil and gas wells in central South Dakota.	Central South Dakota and northwestern Harding County, South Dakota.	Oil and gas wells within the PCIC in northwestern Tripp County, South Dakota; southeastern Jones County, South Dakota; south-central Jones County, South Dakota; northwestern Harding County, South Dakota; and north-central Meade County, South Dakota.
Wildcat Phillips, Fallon, Valley, McCone County fields	Oil and gas fields in Montana.	Southeastern Fallon County, southwestern Dawson County, southeastern McCone County, eastern Valley County, northeastern Phillips County, Montana.	Oil and gas wells within the PCIC (Gas Light, Plevna, Plevna South, Cedar Creek, Weldon, McCone, and Wildcat) in southeastern Fallon County, southwestern Dawson County, southeastern McCone County, Valley County, northeastern Phillips County, Montana.
Mine and Mineral Extraction Sites			
Montana gravel pits	Active surface gravel pits.	Southern Valley County, Southeastern McCone County, Montana.	Gravel pits within the PCIC through southern Valley County, Montana.
Weldon Timber Creek Coal Field	Active surface coal field in northwestern McCone County, Montana.	Northwestern McCone County, Montana.	Coal field within the PCIC through northwestern McCone County, Montana.
Abandoned coal fields	Eighteen abandoned coal fields.	Northwestern and southeastern McCone County, western and southwestern Dawson County, Montana.	Abandoned coal fields within the PCIC through northwestern and southeastern McCone County, western and southwestern Dawson County, Montana.
Fallon County Bentonite Deposit	Active bentonite surface mine in southeastern Fallon County, Montana.	Southeastern Fallon County, Montana.	Active bentonite mine within the PCIC through southeastern Fallon County, Montana.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Fallon County abandoned surface mines and coal fields	One abandoned coal field and five abandoned surface mines in southeastern Fallon County, Montana.	Southeastern Fallon County, Montana.	Abandoned coal field and surface mines within the PCIC through southeastern Fallon County, Montana.
Nebraska active sand and gravel mines	Active sand and gravel mines in Nebraska.	Northeastern Keya Paha County, northern and central Holt County, southern Jefferson County, Nebraska.	Active sand and gravel mines within the PCIC.
Nebraska abandoned sand and gravel pits	Abandoned sand and gravel pits in Nebraska.	Eastern Boyd County, northern and central Holt County, central and southern Antelope County, southern York County, eastern Fillmore County, southern Jefferson County, Nebraska	Abandoned sand and gravel pits within the PCIC in northern and central Holt County, Nebraska.
Nebraska inactive sand and gravel pits	Inactive sand and gravel pits in Nebraska.	Southern Jefferson County, Nebraska.	Abandoned sand and gravel pits within the PCIC.
South Dakota active sand and gravel pits	Active sand and gravel pits in South Dakota	Southeastern and central Tripp County, southeastern Haakon County, eastern Haakon County, northeastern Meade County, northwestern Harding County, South Dakota	Active sand and gravel pits within the PCIC.
South Dakota inactive sand and gravel pits	Inactive sand and gravel pits in South Dakota	Southeastern Tripp County, central Jones County, southeastern Haakon County, northeastern Meade County, South Dakota	Inactive sand and gravel pit within the PCIC.
Nebraska Feedlots	A feedlot is a type of animal feeding operation which is used in farming. Very large feedlots are classified as concentrated animal feeding operations (CAFOs), and are used to increase the size of livestock before slaughter.	Feedlots are used in across the state of Nebraska and have an impact throughout.	The PCIC of the proposed pipeline route would be affected by large feedlots, or CAFOs, southwest of Naper, north of Atkinson, northeast of O'Neill, east of Page, near Orchard, west of Tilder, north of Clarks, near McCool Junction, and near Milligan, Nebraska.
Mt. Echo Feedlot and Beaver Valley Pork	Additional CAFOs	Feedlots are used across the state of Nebraska and have an impact throughout.	The Mt. Echo feedlot falls within the PCIC near St. Edward, Nebraska. The Beaver Valley Pork feedlot falls within the PCIC near St. Edward, Nebraska.

Project Name	Description	Regions Impacted	Geographic Relationship to Proposed Project
Grain and Agronomy Hubs			
Central Valley Agriculture (CVA)—multiple locations	The CVA Clarks location is an agronomy hub that offers fertilizers, chemicals, insecticides, seed and seed treatments, custom application, and precision technology and scouting services to the agricultural sector in central Nebraska.	CVA is located throughout central Nebraska and affects multiple localities in Nebraska.	This CVA Clarks location falls within the PCIC for the proposed Project. The location of the agronomy hub is 2947 26th Road, Clarks, Nebraska

A summary of the residual impacts associated with the general types of projects listed in Table 2.2-1 as well as the potential for these residual effects to be cumulative with the effects of the proposed Project is presented below. While some residual effects associated with past projects may be long-term and/or permanent, many of the residual effects of past projects and effects of the proposed Project are localized. In these situations, the greatest potential for cumulative effects across a broad range of resources from the proposed Project occurs where there is geographic proximity of past projects with the proposed Project. Where appropriate, such as greenhouse gas emissions and effects to federally protected or candidate species, cumulative effects are considered across a larger geographic scale.

2.2.3 Federally Protected and Candidate Species Cumulative Impacts

A detailed cumulative impact assessment is provided in the Final EIS and Supplemental EIS. It should be noted that the potential for a given impact to contribute to cumulative impacts is based on the assumption that the CMRP (Appendix B) is successful and near pre-construction conditions are restored and maintained within the anticipated timeframes.

A number of federally protected or candidate species, under consideration potentially occur in the proposed Project vicinity. These species include 2 mammals, 6 birds, 2 fish, 1 invertebrate, and 2 plants (Table 1.3-1). Further review of these 13 species indicates that the proposed Project would likely adversely affect 1 species, would not likely adversely affect 8 species with implementation of proposed conservation measures, and would have no effect on 4 species. Of the 2 federal candidate species identified within the proposed Project vicinity, it has been determined that the habitat would likely be disturbed or altered.

As indicated in Table 2.2-2, the anticipated overall absence of long-term and permanent impacts to most federally protected or candidate species resources from the proposed Project indicates that cumulative effects to these species are expected to be minimal.

Table 2.2-2 CEA Matrix—Threatened, Endangered, and Candidate Species

Potential Species Impacted [1][2][3]	Proposed Project and Connected Action Impacts		Geographic Extent	Cumulative Impact Potential (Yes/No)
	Construction	Operation		
Mammals:				
Black-footed ferret (*Mustela nigripes*)	(I)	(I)	PA	No
Gray wolf (*Canis lupus*)	(I)	(I)	LA	No
Birds:				
Eskimo curlew (*Numenius borealis*)	N	N	*	No
Greater sage-grouse (*Centrocercus urophasianus*)	(D)	(I)	R	No
Least tern (*Sterna antillarum*)	(I)	(I)	LA	No
Piping plover (*Charadrius melodus*)	(I)	(I)	LA	No
Sprague's pipit (*Anthus spragueii)*	(I)	(I)	LA	No
Whooping crane (*Grus americana*)	(I)	(D)	LA	Yes
Fish:				
Pallid sturgeon (*Scaphirhynchus albus*)	(I)	(I)	PA	No
Topeka shiner (*Notropis topeka*)	(I)	(I)	PA	No
Invertebrates:				
American burying beetle (*Nicrophorus americanus)*	(D)	(D)	LA	Yes
Plants:				
Blowout penstemon (*Penstemon haydenii)*	(I)	(I)	LA	No
White fringed prairie orchid (*Platanthera praeclara)*	(D)	(I)	LA	No

Duration of Impact	Type of Impact	
—Negligible	N	—Negligible Impact
—Temporary/Short Term (<3 yr.)	D	—Direct Impact
—Long-Term (>3 yr.)	I	—Indirect Impact
—Permanent		

Notes: Parentheses around impact indicates that it would be addressed by implementation of Keystone's Construction, Mitigation, and Reclamation Plan, additional mitigations, and/or existing laws and regulations.

Geographic Extent of Potential Impact

Project Area (PA)—Defined by limits of ROW and ancillary facilities, e.g., access roads, pump stations, and construction camps.

Local Area (LA)—Defined as a 2-mile distance on either side of the pipeline ROW and ancillary facilities.

Regional (R)—Defined by resource, e.g., home ranges of wildlife species, bird migration corridor, regional airshed, etc.

Conservation efforts implemented to offset potential losses would reduce the cumulative impacts associated with the proposed Project. Any future projects in the area that reduce and fragment preferred habitat for the American burying beetle may provide the potential for additive cumulative effects to this species. Any additional potential losses would likely require similar conservation measures and mitigations, thus reducing overall cumulative impacts on the American burying beetle.

The majority of the potential Project effects to federally protected or candidate species resources would be indirect, short term or negligible, limited in geographic extent, and associated with the construction phase of the proposed Project only. Indirect and short-term impacts associated with construction of the proposed Project may include reduced species use due to increased human interaction; habitat fragmentation, alteration, and loss; stress and reduced breeding success due to noise, vibration, and human activity; creation of barriers to movement; and reduction in patch size of available habitat. Thus, there is limited potential for cumulative effects of these impacts to be cumulative with other projects; however, additional discussion of federally protected and candidate species is presented below.

Incremental impacts to streams and riparian habitats from future linear project construction and the accidental spread of exotic aquatic invasive plants and animals could increase cumulative impacts to federally protected and candidate species habitat. Increased competition from invasive species could contribute to cumulative impacts to native freshwater mollusks and prairie stream fishes which have been increasingly recognized as vulnerable. Multiple stream and wetland crossings, especially those associated with small clear springs and streams or freshwater mussel beds, could result in impacts to habitat quality that could in conjunction with the impacts of the proposed Project affect federally-protected aquatic species of conservation concern. The spread of invasive plants could also result in cumulative habitat impacts to federally protected plants, if present.

The proposed Project could potentially affect four federally protected or candidate migratory birds (whooping crane, piping plover, interior least tern, and Sprague's pipit) within their migration range from Nebraska to Montana and/or within their breeding habitats. Conservation measures proposed for three of these birds (i.e., whooping crane, piping plover, and interior least tern) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize effects to these birds.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for the four federally protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds, including the greater sage-grouse (although not a migratory bird), interior least tern, piping plover, and Sprague's pipit.

Impacts to federally protected and candidate species from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term or permanent. The greater sage-grouse, Sprague's pipit, and federally protected species may be impacted by habitat loss resulting from construction of the Bakken Marketlink Project, along with future projects in the area that reduce and fragment preferred habitat for these species. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation measures and mitigations, thus reducing overall cumulative impacts on these species.

The transmission line, electrical distribution lines, and substations could result in long-term increased bird collisions, bird predation, and habitat loss. However, with implementation of conservation measures, it is not expected that these lines would have cumulative impacts on birds protected under the MBTA or Bald and Golden Eagle Protection Act.

Other past, present, and foreseeable future projects in South Dakota (as indicated on Figure 2.2.3-1) are relatively sparse with significant geographic separation. However, American burying beetle locations in Nebraska (Figure 2.2.3-2) occur within the proposed Project and several other projects in proximity to these locations. Furthermore, potential impacts to the American burying beetle are associated with the concurrent construction of the TransCanada Gulf Coast pipeline project. Construction of new pipelines or other ground disturbing projects through southern South Dakota and north-central Nebraska could contribute to cumulative mortality and loss of habitat. Any additional potential losses within this species would likely require conservation measures, thus reducing overall cumulative impacts on the American burying beetle.

Past cumulative effects for federally protected and candidate species present near the proposed Project have included habitat loss, alteration, and fragmentation primarily due to agricultural, silvicultural, industrial, urban, and suburban development; reduced water quantity and blockage of fish migrations from impoundment and diversion for agricultural or urban use; and reduced water quality from degradation of riparian habitats and contamination from agricultural, industrial, urban, and suburban runoff. Such cumulative impacts have led to the overall decline and resulting determinations for these species that occur within the proposed Project vicinity.

Implementation of appropriate conservation measures as determined through consultations with federal and state agencies for federally protected and candidate species for the proposed Project would include impact avoidance, minimization, and habitat restoration and compensation to ameliorate long-term cumulative impacts. Proposed Project restoration includes restoration of native vegetation and soil conditions and prevention of spread and control of noxious weeds for disturbed areas. Unavoidable alteration and maintenance of vegetation structure to ensure pipeline safety and to allow for visual inspection would result in some conversion of tall shrub and forested habitats to herbaceous habitats. These conversions are not expected to adversely affect or contribute to cumulative impacts for any federally protected and candidate species.

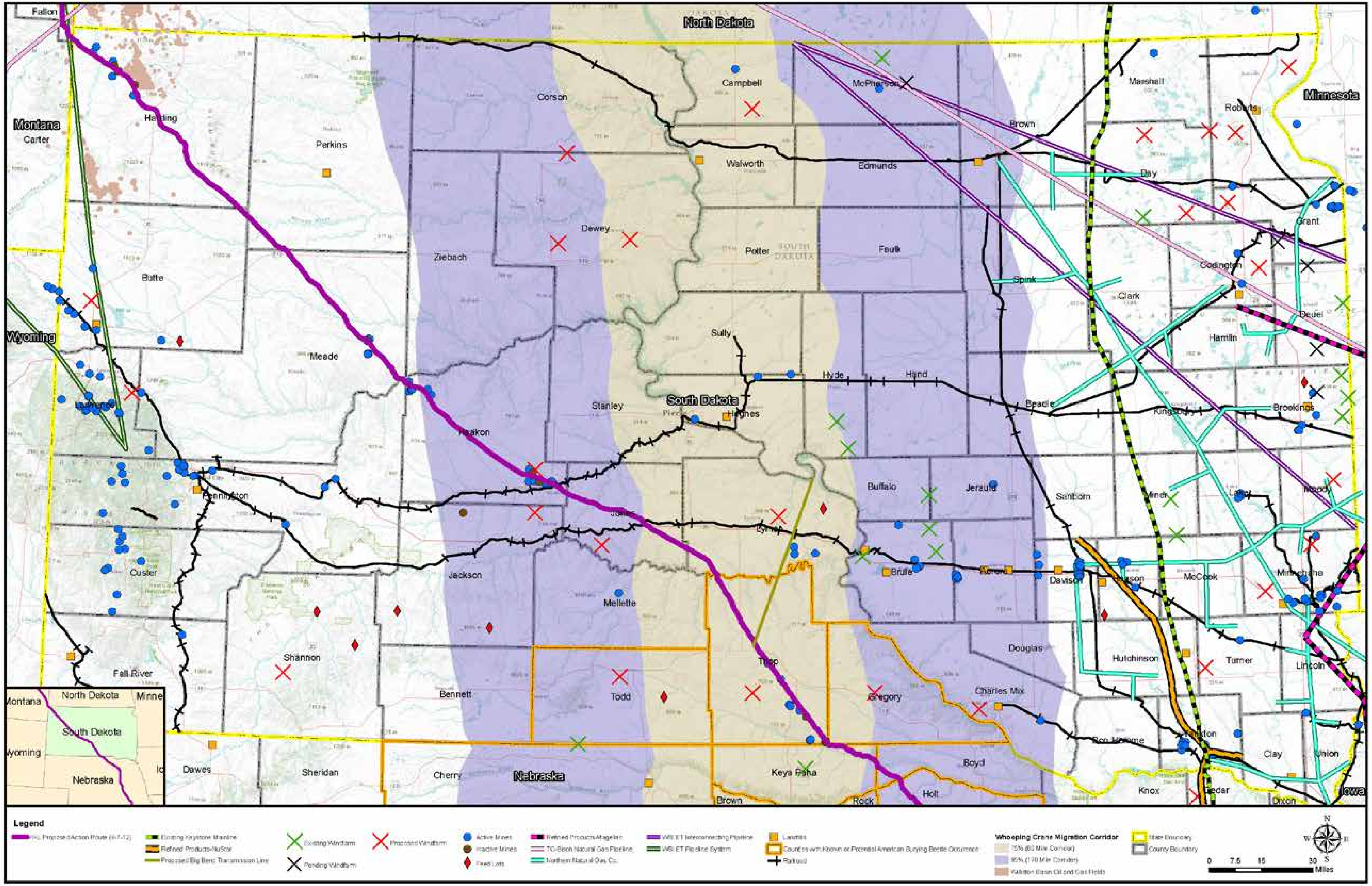


Figure 2.2.3-1 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in South Dakota with American Burying Beetle Areas of Potential Occurrence and Central Flyway Whooping Crane Migration Corridor

-Page Intentionally Left Blank-

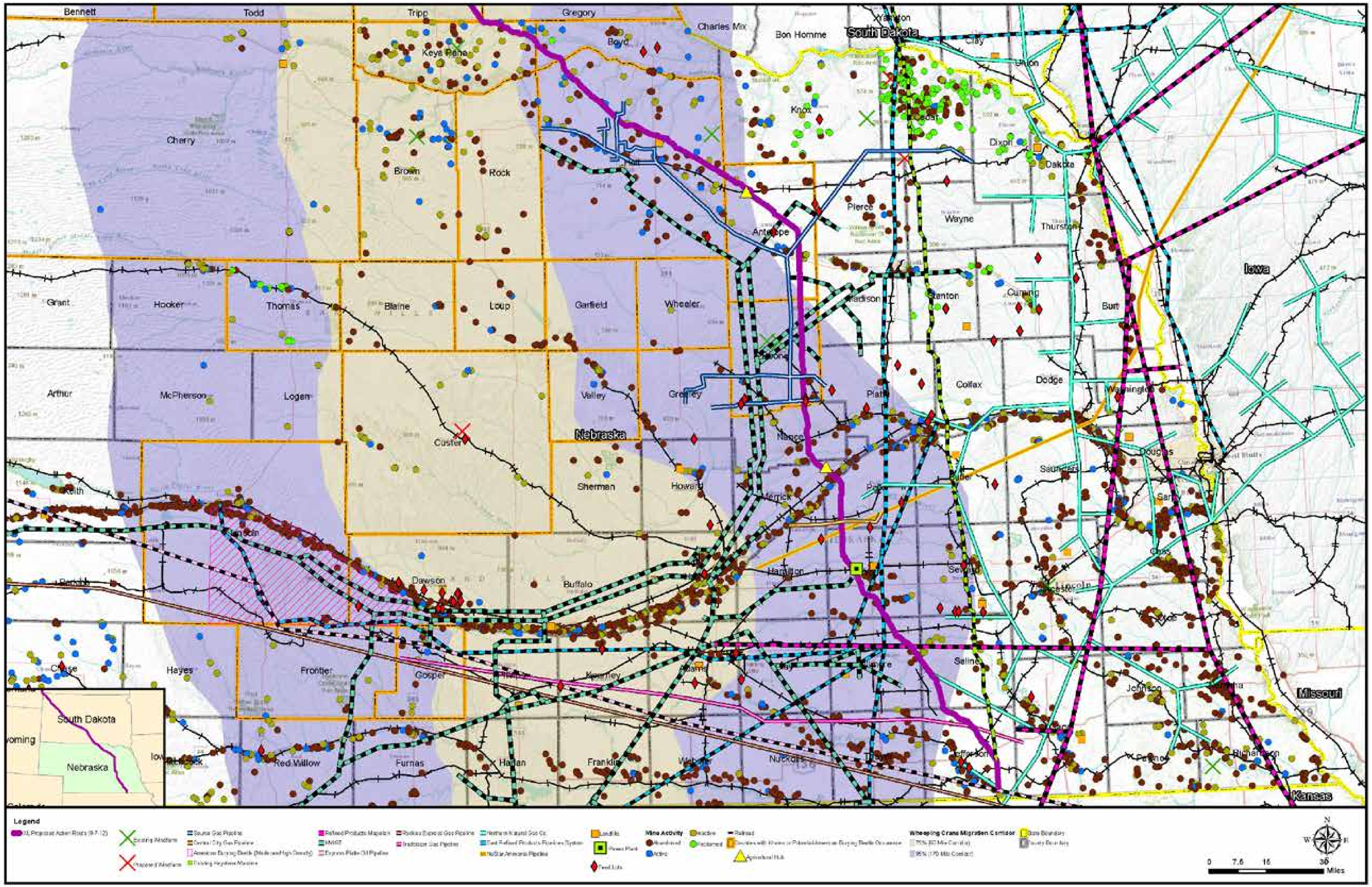


Figure 2.2.3-2 Known Locations of Past, Present, and Reasonably Foreseeable Future Projects in Nebraska with American Burying Beetle Areas of Potential Occurrence and Central Flyway Whooping Crane Migration Corridor

-Page Intentionally Left Blank-

3.0 SPECIES EVALUATION

3.1 FEDERALLY ENDANGERED

3.1.1 Black-footed Ferret– Endangered/Experimental Populations

3.1.1.1 Natural History and Habitat Association

The black-footed ferret (*Mustela nigripes*) was federally listed as endangered on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926; 16 United States Code [USC] 668aa(c)). Listing for the black-footed ferret was revised under the Endangered Species Act on June 2, 1970 (35 FR 8491). Designated non-essential experimental populations were reintroduced to sites in Wyoming, South Dakota, Montana, Arizona, and Colorado between 1991 and 2003; other non-designated reintroductions have occurred in South Dakota, Arizona, Kansas, Montana, and Mexico between 2001 and 2008 (USFWS 2008b). Members of non-essential experimental populations located outside national wildlife refuge or national park lands are protected as proposed species under the ESA (16 USC 1531 *et seq.*) and as threatened species where they occur on national wildlife refuges or national parks (Section 10(j)). Members of reintroduced populations within the species historic range that have not been designated as experimental populations are protected as endangered.

Historically, the range of the black-footed ferret coincided closely with that of the black-tailed prairie dog (*Cynomys ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*), and white-tailed prairie dog (*C. leucurus*), throughout the intermountain and prairie grasslands extending from Canada to Mexico (USFWS 2008b). The black-footed ferret was considered extinct by the middle of the last century until it was documented in South Dakota in August 1964 (Fortenbery 1972, Hillman 1968, Henderson et al. 1969, Linder et al. 1972) and again in 1981 near Meeteetse, Wyoming (Fitzgerald et al. 1994, USFWS 1988a). However, the South Dakota population subsequently disappeared and the Wyoming population declined to only a few remaining individuals. The remaining animals in the wild were captured and provided the basis for the ongoing captive breeding program (USFWS 1988a).

No wild populations of black-footed ferrets have been found since the capture of the last black-footed ferret in Meeteetse, Wyoming, and the captive black-footed ferret population is the primary species population. Sustainable ferret populations are exclusively dependent on black-tailed prairie dog colonies for food and habitat. Any black-tailed prairie dog towns exceeding 80 acres in size or any towns that are part of a >1,000-acre complex of prairie dog colonies may be considered black-footed ferret habitat, and surveys for ferrets may be required prior to any construction through colonies meeting the above criteria.

Non-essential experimental populations of black-footed ferrets have been established in several large colonies of black-tailed prairie dogs in South Dakota and Montana. In the unlikely event that future reintroduced ferrets would occur within the project area, take of these animals would not be permitted. However, land use activities in the non-essential experimental area would not be limited by the presence of any black-footed ferrets located therein. Currently 18 reintroduced populations are in Montana, South Dakota, Wyoming, Colorado, Utah, Arizona, Kansas, New Mexico, and Mexico (USFWS 2008b). No critical habitat has been designated for this species.

Black-footed ferrets are primarily nocturnal, solitary carnivores that depend on prairie dogs (Fitzgerald et al. 1994). Over 90 percent of the black-footed ferret's diet is comprised of prairie dogs, and ferrets use prairie dog burrows as their sole source of shelter (Fitzgerald et al. 1994). Black-footed ferrets typically breed from March to May (USFWS 1988a). The gestation period ranges from 41 to 45 days, with as many as 5 young born in late May and early June. The kits remain underground until late June or early July; upon emerging, they may accompany the female during nocturnal foraging. Male ferrets are not active in rearing the young and live a solitary life except during the breeding season. Ferrets are most commonly observed in late summer or early fall (Hillman and Carpenter 1980).

The black-footed ferret's close association with prairie dogs was an important factor in its decline (USFWS 2008b). Reasons for decline include habitat loss from conversion of native prairie to agriculture, poisoning of prairie dog towns, and habitat modification due to disease (USFWS 2008b).

3.1.1.2 Potential Presence in Project Area

The proposed Project crosses the historic range of the black-footed ferret in Montana, South Dakota, and Nebraska. Black-footed ferrets are not known to exist outside reintroduced populations in the western United States. Eleven reintroductions of black-footed ferrets have occurred in Montana, South Dakota, and Kansas; these were outside the previous Keystone XL ROW (USFWS 2008b). Natural Heritage Program data for Montana and South Dakota (Montana Natural Heritage Program 2008, SDGFP 2008) contains no historical records of black-footed ferrets within 5 miles of the proposed ROW.

During the meeting with Keystone representatives on May 5, 2008, the USFWS Grand Island Ecological Services Field Office indicated that ferrets do not occur within the original Keystone XL Project area in Nebraska and proposed Project impacts would be negligible. In 2012, the USFWS affirmed that the proposed Project area in Nebraska lacks suitable habitat and therefore was unlikely to impact the ferret (USFWS 2012b). According to the USFWS Pierre Ecological Services Field Office, black-tailed prairie dog towns in the entire state of South Dakota are block-cleared, meaning the towns no longer contain any wild free-ranging black-footed ferrets and activities within these areas that result in the removal of the black-tailed prairie dogs and/or their habitat would no longer be required to meet the USFWS survey guidelines for black-footed ferrets or undergo consultations under Section 7 of the ESA (AECOM 2008a).

Since the black-footed ferret is dependent on prairie dogs, the assessment of potential impacts to experimental populations was focused on black-tailed prairie dog colonies and complexes that would be affected by construction of the proposed Project. The proposed route does not occur within the known ranges of the Gunnison's prairie dog or white-tailed prairie dog (NatureServe 2009).

Aerial and/or pedestrian field surveys were conducted from 2008 through 2012 along the entire proposed Project route in Montana, to identify prairie dog towns crossed by the construction ROW. During the 2008 surveys, one potential prairie dog town was identified near Milepost (MP) 65.6 in Valley County, Montana, 570 feet from the previous proposed Project route. Subsequent surveys determined that this town was occupied by Richardson's ground squirrel (*Urocitellus richardsonii*), and possibly black-tailed prairie dogs, although none were observed. The proposed

Project route avoids this colony, due to a Montana Department of Environmental Quality (MDEQ) route modification incorporated into the proposed Project.

The eight prairie dog towns found along the proposed Project in South Dakota and Nebraska do not require mitigation measures or additional consultation under the ESA because any black-footed ferrets potentially associated with these prairie dog towns are reintroduced and designated as non-essential experimental populations (AECOM 2008a, USFWS 2008c) and/or there is no suitable habitat available for the black-footed ferret. All prairie dog towns within the Project ROW are unsuitable for the reintroduction of the black-footed ferret, and there are no currently existing black-footed ferret populations within the ROW (USFWS 2011).

3.1.1.3 Impact Evaluation

Construction

Direct impacts to black-footed ferrets as a result of construction would include increased habitat loss, habitat fragmentation, and potential injury or mortality if black-footed ferrets are present within the construction area. Indirect impacts would include disturbance and displacement due to increased noise and human presence during construction; reduced habitat availability due to destruction or disturbance of cover habitat in prairie dog towns, and reduced prey availability due to mortality or reduced reproduction of black-tailed prairie dogs.

One potential black-tailed prairie dog colony was identified in 2008 as being crossed by the previous proposed Project ROW in Montana (AECOM 2009c); however, this colony is too small to support black-footed ferrets (USFWS 2011) and is also avoided by the proposed route. It is unlikely that the proposed Project would have an adverse effect on black-footed ferrets given the lack of suitable habitat in the proposed Project area.

Operations

Routine operation of the proposed Project is not expected to affect black-footed ferrets or their habitat. Following construction, maintenance activities (e.g., vegetation management) along the ROW would not preclude the re-establishment of short-grass vegetation within both the temporary and permanent ROW. Normal pipeline operations would have negligible effects on the black-footed ferret. Direct impacts could include mortality due to exposure to vehicles and human disturbance during ground surveillance that happens annually, but are unlikely due to the nocturnal activity of the black-footed ferret. Indirect impacts during aerial and ground surveillance could result from increased noise, and human presence could cause short-term displacement, but are unlikely due to the nocturnal activity of the black-footed ferret and short duration of the aerial reconnaissance, once every 2 weeks.

According to the Keystone's Pipeline Temperature Effects Study (Appendix F), the pipeline does have some effect on surrounding soil temperatures, primarily at pipeline depth, in an area surrounding the pipe. Effects of pipeline-elevated soil temperatures vary seasonally. Heat effects in soil near the surface, where most plant root systems are located, are less pronounced than near soil around the pipe. Surficial soil temperatures relevant to vegetation are impacted mainly by climate (such as air temperature and plant water availability) with negligible effect attributed to the operating pipeline. This is because the largest increase in temperature, in the summer months, is found within 24 inches of the pipeline. In addition, a minimum of 4 feet of cover over the top of the pipeline would result in minimal impacts to vegetation.

Adverse effects to black-footed ferrets resulting from a crude oil spill from the pipeline are highly improbable due to the low probability of a spill, the low probability of a spill coinciding with the presence of black-footed ferrets, and the low probability of a ferret contacting the spilled product (see Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis).

Power Lines and Substations

Power line routes associated with the proposed Project are likely to attract raptors, known to be predators of the black-footed ferret and their primary prey, prairie dogs. The proposed transmission line route locations in Montana would be analyzed for any active prairie dog towns. Protection measures could then be implemented by electrical service providers to minimize raptor perching in accordance with the Avian Power Line Interaction Committee (APLIC), Suggested Practices for Avian Protection on Power Lines (APLIC 1996).

Electrical power line providers are responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments to construct new power lines necessary to operate the proposed Project. Keystone would inform electrical power providers of the requirements for consulting on threatened and endangered species issues with the USFWS for the electrical infrastructure components constructed for the proposed Project to prevent impacts to black-footed ferrets.

3.1.1.4 Cumulative Impacts

Incremental loss or alteration of black-tailed prairie dog colonies through prior project construction and operation in addition to similar effects from the proposed Project could lead to cumulative impacts on the black-footed ferret in Montana and South Dakota. However, the black-tailed prairie dog colonies that would be crossed by the proposed Project were determined to be too small to support black-footed ferrets.

3.1.1.5 Conservation Measures

In Nebraska and South Dakota, black-footed ferret surveys are no longer recommended in prairie dog towns. To prevent potential direct or indirect impacts to the black-footed ferret from construction in Montana, Keystone has committed to:

- Provide USFWS with the results of Montana prairie dog town surveys and continue to coordinate with the Montana USFWS Ecological Services Office to determine the need for black-footed ferret surveys, in accordance with the USFWS Black-footed Ferret Survey Guidelines (USFWS 1989). At this time, the Department has determined, based on feedback from the USFWS, that no black-footed ferret surveys would be required.
- Complete surveys to identify prairie dog colonies in Fallon County, Montana consistent with the Final EIS to determine if any Category 3 colonies or complexes occur and could be avoided.
- Workers would not be allowed to keep domestic pets in construction camps and/or worksites.
- Workers would be made aware of how canine distemper and sylvatic plague diseases are spread (domestic pets and fleas).

- Workers would not be allowed to feed wildlife.
- Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies.

3.1.1.6 Determination

Effect on Critical Habitat

No critical habitat has been identified for this species. Therefore, the proposed Project would not result in the destruction or adverse modification to federally designated critical habitat for the black-footed ferret.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" wild or reintroduced non-experimental populations of the endangered black-footed ferret. This determination is based on agency provided information, the lack of potential for occurrence of wild populations of black-footed ferrets within the proposed Project area, and Keystone's commitment to follow recommended conservation measures. No prairie dog towns would be crossed or impacted by the proposed Project.

3.1.2 Interior Least Tern - Endangered

3.1.2.1 Natural History and Habitat Association

The interior population of the least tern (previously *Sterna antillarum*, now *Sternula antillarum*) was listed as endangered on May 28, 1985 (50 FR 21784-21792). Historically, the breeding range of this population extended from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. It included the Rio Grande, Red, Missouri, Arkansas, Mississippi, and Ohio river systems. The interior least tern is a migratory bird that winters along the Gulf Coast, the coast of Caribbean Islands, the eastern coast of Central America, and northern South America. The interior least tern continues to breed in most of the historic river systems, although its distribution generally is restricted to less altered river segments (USFWS 1990). No critical habitat has been designated for this population.

Interior least terns spend four to five months at their breeding sites. They arrive at breeding areas from late April to early June. Nesting areas of interior least terns include sparsely vegetated sand and gravel bars within a wide, unobstructed river channel or salt flats along lake shorelines (Nelson 1998; USFWS 1990). Nesting locations are usually well above the water's edge on dry elevated sandbars and shorelines. These areas offer the best protection against being flooded during most of the nesting season. The extent of available nesting area depends on water levels and the resulting amount of exposed bar and shoreline habitat. The interior least tern also nests on artificial habitats such as sand and gravel pits next to large river systems and dredge islands (Campbell 2003; USFWS 1990).

Interior least terns are considered colonial nesters; colonies generally consist of up to 20 nests. However, colonies with up to 75 nests have been recorded on the Mississippi River. Most interior least tern nesting areas on the rivers crossed by the Project would be limited to a few nesting pairs. Interior least terns nest on the ground and create a simple unlined depressional scrape, typically on sites that are dry, sandy, and relatively free of vegetation. The nesting season for the interior least tern is from April 15 through September 1. Usually two to three eggs are laid by late May (USFWS 1990) or early June. Both the male and female share incubation duty which generally lasts from 20 to 25 days. Fledging occurs within 3 weeks after hatching. Departure from colonies varies but is usually complete by early September (USFWS 1990).

Interior least terns predominately eat fish, feeding on minnows they catch in shallow waters of rivers, streams, and lakes. On the Great Plains, fish are the primary diet of this species (Nelson 1998, USFWS 1990). Although terns nesting at sand and gravel pits or other artificial habitats may travel up to 2 miles to forage (USFWS 1990), terns usually feed close to their nesting sites. Feeding behavior involves hovering and diving over standing or flowing water to catch small fish.

Alteration and destruction of riverine habitats, primarily as a result of changes in channel characteristics due to channelization, irrigation, and construction of reservoirs and pools, is a threat to the long-term survival of this species. These types of disturbances may eliminate nesting sites, disrupt nesting interior least terns, or may result in sandbars that are unsuitable for nesting due to vegetation encroachment or frequent inundation. The regulation of river flow regimes using dams may also eliminate nesting sites or disrupt nesting interior least terns. Historically, summer flow periods were fairly predictable and consisted of a high flow in May and June and a decline in flow for the remainder of the summer. This decline in flow levels allowed interior least terns to nest as water levels dropped and sandbars became available. The current human regulation of river flow regimes using dams may result in high flow periods extending into the normal nesting period or occurring after nesting has begun, thus flooding active nest sites (USFWS 1990).

3.1.2.2 Potential Presence in Project Area

Montana

According to the USFWS Billings Ecological Services Field Office (AECOM 2008b) and the MFWP (AECOM 2009d), the Yellowstone River crossing in Dawson County, Montana has historically supported, and currently supports, breeding populations of interior least terns.

South Dakota

During a meeting with Keystone representatives on June 10, 2008, SDGFP indicated that the Cheyenne River crossing on the border of Meade, Pennington, and Haakon counties has historically supported, or currently supports, breeding populations of interior least terns (AECOM 2008d).

Nebraska

The distribution of interior least terns along the proposed Project route in Nebraska includes the Platte, Loup, and Niobrara rivers (AECOM 2008c). The Project would cross the Platte River at the border between Merrick and Hamilton counties; sandbars and sand/gravel pits associated with this segment of the river are known to still support least tern breeding populations. The Loup River in Nance County and the Niobrara River on the border of Keya Paha and Rock counties contain sandbars and also continue to support breeding interior least terns. In addition to breeding on riverine sandbars and at sand and gravel mining operations and foraging in rivers and associated wetlands, interior least terns migrate through the Great Plains during both spring and fall.

In 2008, 2011, and 2012, surveys for suitable habitat and occurrences of interior least tern nests were conducted at the crossings of the Missouri and Yellowstone rivers in Montana, the Cheyenne River in South Dakota, and the Platte, Loup, and Niobrara rivers in Nebraska (Table 3.1-1, below) (Appendix H consists of the Summary Report of the July 2008 Piping Plover (*Charadrius melodus*) and Least Tern (*Sterna antilarum*) Surveys for the Steele City Segment of the Keystone XL Project, Appendix I consists of the Summary of 2011 Federally-Listed Species Searches for the Keystone XL Pipeline Project Steele City Segment (including the Western Prairie Fringed Orchid, Interior Least Tern, and Piping Plover, and Appendix J consists of the Summary of 2012 Special Status Species Searches for the Keystone XL Pipeline Project Nebraska Reroute (including the Western Prairie Fringed Orchid, Interior Least Tern, and Piping Plover). In the winter of 2011, the Missouri, Yellowstone, and Cheyenne rivers flooded, and suitable interior least-tern habitat may have also flooded and thus may not have been present that year.

Table 3.1-1 Occurrence Surveys for the Interior Least Tern within 0.25 Mile of the Proposed Project Route in 2008, 2011, and 2012

State	County	Survey Location	Survey Date	Survey Results	Comments
Montana	Valley / McCone	Missouri River	June 3 and July 11, 2011	No interior least terns observed at river crossings.	Poor bank and no island nesting habitat, suitable foraging habitat.
Montana	Dawson	Yellowstone River	June 3 and July 11, 2011	No interior least terns observed at river crossings.	Suitable nesting habitat was not observed but could be present in other years depending on river flows. Suitable foraging habitat was noted.
South Dakota	Meade / Pennington / Haakon	Cheyenne River	July 23, 2008, June 6, 2011	No interior least terns observed at river crossings.	Good bank and potential island nesting habitat depending on river flows, suitable foraging habitat at crossing location.
Nebraska	Keya Paha / Rock	Niobrara River	July 22, 2008, July 7, 2011, June 22 - 26, 2012	Four interior least terns observed in 2012.	Good bank and island nesting habitat, suitable foraging habitat at crossing location.
Nebraska	Nance	Loup River	July 21, 2008, July 6 & 7, 2011, June 14 – 18, 2012	Two interior least terns observed in 2012, no nesting.	Suitable nesting and foraging habitat at crossing location.
Nebraska	Merrick / Hamilton	Platte River	July 22, 2008, July 6 & 7, 2011, July 15 – 20, 2012	No interior least terns observed at river crossings.	Good nesting and foraging habitat at crossing location, however very little water present in 2012 due to drought

3.1.2.3 Impact Evaluation

The proposed Project could affect the interior least tern through disturbance of individuals or modification to nesting and foraging habitats. Surface water depletions to the Platte River system can also adversely affect the interior least tern. Disturbances in proximity to active nests can cause nesting activity disruption and loss of nests.

Construction

The primary construction-related impacts would be disturbance and potential exposure to small fuel spills and leaks from construction machinery. The chance of construction-related spills within interior least tern habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly. According to Keystone's CMRP (Appendix B), hazardous materials, chemicals, fuels, and lubricating oils would not be stored, staged, or transferred (other than possible refueling) within 100 feet of any waterbody, wetland, storm drain, drop inlet, or high consequence area. The following construction measures would be implemented to minimize impacts to interior least terns:

- All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands.
- All equipment would be parked overnight at least 100 feet from a watercourse or wetland, if possible.
- Equipment would not be washed in streams or wetlands.
- Construction and restoration activities would be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.
- Each construction crew and cleanup crew would have on hand sufficient tools and materials to stop leaks including supplies of absorbent and barrier materials that would allow for rapid containment and recovery of spilled materials.
- Refueling and lubrication of construction equipment would generally be restricted to upland areas at least 100 feet away from streams and wetlands. Where this is not possible, the equipment would be fueled by designated personnel with special training in refueling, spill containment, and cleanup.
- Keystone would mark and maintain a 100-foot area from these river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers would be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling would be completed by trained personnel and would use secondary containment. If interior least tern nests are found at these crossings, then Keystone would 1) adhere to the 0.25 mile buffer of no construction activity and 2) continue to monitor nests if any are within 0.25 mile of the construction footprint until the young have fledged.
- Keystone has committed to conducting surveys before construction begins if construction activities occur during the nesting season.

The interior least tern is known to nest within or near the proposed Project at the Platte, Loup, and Niobrara rivers in Nebraska, the Cheyenne River in South Dakota, and the Yellowstone River in Montana. No direct impacts to interior least tern nesting habitat would be anticipated at these locations, since pipeline placement across the rivers would be completed by the HDD method. Minimal hand clearing of vegetation and limited human access would be required within the riparian areas of these rivers in order to use the Tru-Tracker® cable (clearing would be limited to a 3-foot maximum hand cleared path) that is associated with the drilling equipment and in order for equipment to access these rivers to potentially withdraw water for HDD and hydrostatic tests for the proposed Project. Drilling equipment pads and staging areas for HDD will have required set-backs from the riparian zone in each river and will be determined during the federal, state, and local permitting processes. Setbacks can vary from 50 to 100 feet, depending on the river and local jurisdictions.

Indirect impacts could result from increased noise and human presence at work site locations if nesting interior least terns are located within 0.25 mile of the proposed Project (USFWS 2012b). Prior to construction-related activities that would occur within 0.25 mile from nesting interior least terns, Keystone proposes to conduct presence/absence surveys just prior to beginning construction-related activities to identify active nest sites, in coordination with the USFWS. If active nest sites are identified, the USFWS would be notified and appropriate protection measures implemented on a site-specific basis in coordination with the USFWS. These protection measures may include temporarily delaying work until young have fledged the nest or making modifications to the pipeline corridor, if possible. Should night-time HDD work occur, lights would be downshielded. If least terns are documented within the construction corridor, the following potential measures would ensure minimal effects to either nesting adults or fledglings:

- Avoid construction activities within 0.25 mile from nesting terns.
- Temporarily delay construction activities until young have fledged the nest.
- Make minor adjustments to pipeline corridor, if possible.

Impacts to the interior least tern from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided based on Keystone's plan to withdrawn the volume needed at a rate less than 10 percent of the baseline daily flow and to return water back to its source within a 30-day period. The one-time water use for hydrostatic testing, low volume of water used for testing (compared to daily flows in the river basin), and the return of the water to the river source would not impact least tern nesting habitat.

Operations

Similar constraints and/or mitigation measures mentioned above may apply to any pipeline maintenance activities.

The major rivers that contain interior least tern habitat would be crossed using the HDD method which would result in a burial depth of 25 feet or greater from the river bottom. It is highly unlikely that a leak in the pipeline would occur coincident with these locations, and when interior least terns were present. In the event of a leak, the crude oil would need to penetrate greater than 20 feet of overburden before reaching the river, thereby reducing the risk in some cases of crude oil reaching the river and the potential for exposure. Additionally, these major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity

Management Rule, 49 CFR 195) and require heavier wall pipe be used for the HDD method. Further, if a significant spill event were to occur, federal and state laws would require clean up.

Direct contact with a crude oil spill could result in adverse effects to interior least terns due to oiling of plumage, crude oil ingestion from contaminated plumage and prey, and crude oil transfer to eggs and young. While these exposure routes have the potential to cause adverse effects to individuals, the probability of adverse effects to interior least terns are unlikely due to the low probability of a spill and the low probability of the spill coinciding with the presence of least tern individuals. (See Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis, for further information regarding impacts to wildlife from a potential spill event.)

Aerial surveillance would be conducted 26 times per year at intervals no greater than once every 3 weeks; the aircraft passes an area quickly at an altitude of about 1,000 feet. Indirect impacts during aerial and ground surveillance are unlikely to disturb nesting interior least terns.

According to Keystone's Pipeline Temperature Effects Study (Appendix F), the proposed pipeline would have some effect on surrounding soil temperatures, primarily at pipeline depth. There is limited information on the effects of pipeline temperatures in relation to surface water and wildlife. Because the pipeline is buried greater than 25 feet below the river bottom using the HDD method, temperature dissipation effects would be negligible.

Power Lines and Substations

The construction of a new electrical power line segment across the Yellowstone River in Montana and the Platte River in Nebraska would incrementally increase the collision and predation potential for foraging and nesting interior least terns in the proposed Project area. Construction of these power line segments during the nesting season would also potentially disturb nesting and brood-rearing birds. Based on habitat and occurrence surveys for this species at the Platte River crossing, nesting habitat quality within line of sight of the proposed Project centerline was considered to be of good quality. Additionally, correspondence with MFWP (AECOM 2008b) and results of biological surveys to delineate wetlands and waterbodies identified good quality breeding habitat at the Yellowstone River crossing.

Protection measures could be implemented by electrical service providers to minimize or prevent construction disturbance, collision risk, and predation risk to foraging interior least terns at the Platte River and Yellowstone River crossings with the use of standard measures as outlined in *Mitigating Bird Collision with Power Lines* (APLIC 1994). Electrical power line providers are responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments to construct new power lines necessary to operate the proposed Project. To prevent impacts to foraging least terns, electrical power providers, except those along the proposed Nebraska reroute, made commitments to consult with the USFWS on threatened and endangered species issues for the electrical infrastructure components constructed for the proposed Project. These commitments are included in Appendix A (Letters of Section 7 Consultation Commitments from Power Providers). After the pipeline route is selected in Nebraska, the power providers will complete their analyses and consult with the USFWS on their power line routes. Conservation measures applicable to power lines are presented below.

3.1.2.4 Cumulative Impacts

The proposed Project could potentially affect four federally protected or candidate migratory birds (the whooping crane, piping plover, interior least tern, and Sprague's pipit) within their migration range from Nebraska to Montana and/or within their nesting habitats. Conservation measures proposed for three of these birds (i.e., whooping crane, piping plover, and interior least tern) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize effects to these birds.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for the four federally protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds, including the greater sage-grouse (although not a migratory bird), interior least tern, piping plover, and Sprague's pipit.

Impacts to federally protected and candidate species from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term or permanent. The greater sage-grouse, Sprague's pipit, and federally protected species may be impacted by habitat loss resulting from construction of the Bakken Marketlink Project, along with future projects in the area that reduce and fragment preferred habitat for these species. Construction of the proposed Big Bend to Witten 230-kV Transmission Line in southern South Dakota during the breeding season could potentially disturb nesting and brood-rearing interior least terns. Operation of the line would increase the collision and predation hazards for feeding and nesting interior least terns in the Project area. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on these species.

The transmission line, electrical distribution lines, and substations could result in long-term increased bird collisions, bird predation, and habitat loss. However, with implementation of conservation measures, it is not expected that these lines would have cumulative impacts on the interior least tern.

3.1.2.5 Conservation Measures

The following conservation measures, based on agency consultation, would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the interior least tern nesting season:

- Pre-construction surveys would occur within 0.25 mile from suitable breeding habitat at the Platte, Loup, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the nesting season (April 15 to September 1 inclusive) to ensure that there are no nesting pairs within 0.25 mile of the construction area. Daily surveys for nesting terns would be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat.

- Construction would not be permitted within 0.25 mile from an occupied nest site during the nesting season or until the fledglings have left the nesting area.
- Downshielding of lights will be used should HDD occur at night, should the HDD site lack vegetative screening, and an active interior tern nest is located within 0.25 mile from the HDD sites.

Conservation measures to avoid or minimize adverse impacts to breeding and foraging interior least terns from new power lines will vary depending on the circumstances, but may include the following measures:

- Marking of new power lines with bird flight diverters (preferably Swan Spiral diverters or Firefly diverters) within 0.25 mile of interior least tern nesting sites on river systems or commercial sandpit areas.
- If construction of power lines occurs during the interior least tern nesting season, surveys of potential riverine or sand pit interior least tern nesting areas within 0.25 mile of new power lines and within 2 weeks of construction to determine presence of nesting interior least terns. If nesting interior least terns are present, construction would cease until all interior least tern chicks fledge from the site.
- Distribution lines supplying power to Pump Station 23 and Pump Station 24 should be marked with bird deflectors where they cross rivers and within 0.25 mile of each side and between rivers and sand and gravel mining areas to reduce potential injury or mortality to interior least terns.

3.1.2.6 Determination

Effect on Critical Habitat

No critical habitat has been designated for this species. Therefore, the proposed Project would not result in the destruction or adverse modification to federally designated critical habitat for the interior least tern.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" interior least terns. This determination is based on Keystone's plan to HDD the Platte, Loup, Niobrara, Cheyenne, and Yellowstone rivers and Keystone's commitment to follow recommended conservation measures identified by the USFWS.

Although it is possible that a spill event could result in an adverse effect on this species, the probability of adverse effects to interior least terns are unlikely due to the low probability of a spill, the likelihood that most spills would be very small in size, and the very low probability of the spill coinciding with both the location and presence of individual least terns. In the unlikely event of a leak, the crude oil would need to penetrate a significant amount of overburden before reaching the river, thereby reducing the risk in same cases of crude oil reaching the river and the potential for exposure. As a result, no direct or indirect impacts would likely result from the proposed Project operation.

3.1.3 Whooping Crane - Endangered

3.1.3.1 Natural History and Habitat Association

The whooping crane (*Grus americana*) was listed as endangered on March 11, 1967 (32 FR 4001). Whooping cranes are migrating birds that occur only in North America. In 2006, the total wild population was estimated to be 338 birds (Canadian Wildlife Service [CWS] and USFWS 2007). This estimate includes 1) 215 birds in the self-sustaining Aransas-Wood Buffalo National Park Population (AWBP) that winters in coastal marshes in Texas and migrates to Canada to nest in Wood Buffalo National Park and adjacent areas, as well as 2) 123 captive-raised birds that have been released in Florida and the eastern United States in an effort to establish a non-migratory population in Florida and a migratory population between Florida and Wisconsin (CWS and USFWS 2007). The last remaining bird in the Rocky Mountain reintroduced population died in the spring of 2002 (CWS and USFWS 2007). The overall decline of the whooping crane has been attributed to habitat loss, direct disturbance and hunting by humans, predation, disease, and collisions with manmade features (CWS and USFWS 2005).

During spring and fall migration, the AWBP population moves through the central Great Plains including portions of Montana, North Dakota, South Dakota, and Nebraska. Birds from the AWBP population depart from their wintering grounds in Texas from late March through May 1. Fall migration typically begins in mid-September with most birds arriving on wintering grounds between late October and mid-November (CWS and USFWS 2005).

Whooping cranes use a variety of habitats during migration (Howe 1987, Lingle 1987, Lingle et al. 1991, Johns et al. 1997). The whooping crane is most closely associated with river bottoms, marshes, potholes, reservoirs, prairie grasslands, and croplands (CWS and USFWS 2005). Whooping cranes generally use seasonally or semi-permanently flooded palustrine wetlands, broad river channels, and shallow portions of reservoirs for roosting and various cropland and emergent wetlands for feeding (Austin and Richert 2001, Johns et al. 1997). Whooping cranes have also roosted at stock ponds. They generally feed on small grains (including a number of cultivated crops), aquatic plants, insects, crustaceans, and small vertebrates (Oklahoma State University 1993). Cranes roost on submerged sandbars in wide unobstructed channels that are isolated from human disturbance (Armbruster 1990).

Critical habitat for whooping cranes has been designated in Nebraska and includes a segment of the 3-mile-wide, 56-mile-long reach of the Platte River from Lexington to Denman, Nebraska (43 FR 20938-942, CWS and USFWS 2005). This critical habitat is several miles west of the proposed Project ROW; no critical habitat would be crossed by the Project.

3.1.3.2 Potential Presence in Project Area

The whooping crane occurs as a migrant throughout the proposed Project area (USFWS 2012b). Whooping cranes use shallow, sparsely vegetated streams and wetlands in which they feed and roost during migration. Migration periods for the whooping crane can vary widely with weather patterns. In general, spring migration extends from March 15 through May 31 in Nebraska, South Dakota, and Montana and fall migration extends from September 1 through November 31. Whooping cranes pass though the eastern edge of Montana and through South Dakota where they use suitable roosting and foraging habitats in riverine and wetland systems.

Montana

During a meeting with Keystone representatives on February 3, 2009, the MFWP identified the Yellowstone River as a potential stop-over site for whooping cranes (AECOM 2009f).

South Dakota

The Missouri River system is used by whooping cranes in South Dakota, but they also can use any wetland during severe weather episodes and wetlands close to agricultural lands where they can feed. Correspondence with SDGFP indicates the White and Cheyenne rivers contain suitable stop-over habitat although it is very unlikely that whooping cranes would be present at these crossings (AECOM 2008e).

Nebraska

According to the USFWS Grand Island Ecological Services Field Office and the NGPC, major river systems used by whooping cranes in Nebraska include the Platte, Loup, Republican, Cedar, and Niobrara rivers (USFWS 2008e). The Platte, Loup, and Niobrara rivers would be crossed by the proposed Project. As mentioned above, the USFWS has designated critical habitat for the whooping crane along a stretch of the Platte River several miles west of the proposed Project area (CWS and USFWS 2005).

Ill-timed human activities in the vicinity of important roosting and feeding habitats can disturb whooping cranes. A whooping crane survey protocol was developed by USFWS to assist Keystone with conducting surveys for this species. Power lines providing electricity to power pumping stations could pose a collision risk to whooping cranes if located near wet meadows, wetlands, stock ponds and other waterbodies (USFWS 2012b). The majority of the proposed Project route in the southern half of South Dakota and all of Nebraska is within the 95 percent (170 mile-wide) central flyway whooping crane migration corridor for the Aransas-Wood Buffalo whooping crane population (CWS and USFWS 2005) (i.e., 95 percent of the Aransas-Wood Buffalo population flies within this flyway migration corridor, which crosses north-south through the central Great Plains) (Figure 3.1.3-1). The proposed Project in Montana and the northern half of the Project route in South Dakota is west of the 95 percent flyway migration corridor. A 60-acre pipe yard for the proposed Project in North Dakota is also west of the flyway migration corridor. Individual birds can be found outside the 95 percent flyway migration corridor, and could possibly occur within the proposed Project area in Montana during spring and fall migrations. Possible areas used by whooping cranes during migration would include major river systems and their associated wetlands, as well as palustrine wetlands and shallow areas of reservoirs, stock ponds, and other lacustrine wetlands.

3.1.3.3 Impact Evaluation

Construction

The primary construction-related impacts would be disturbance and potential exposure to small fuel spills and leaks from construction machinery. The chance for construction-related spills within whooping crane roosting and foraging habitat is minimal. According to Keystone's CMRP (Appendix B), "The Contractor shall not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating within 100 feet of any waterbody. The Contractor shall not refuel construction equipment within 100 feet of any waterbody. If the Contractor must refuel construction equipment within 100 feet of a waterbody, it must be done in accordance with the requirements outlined in CMRP Section 3, Spill Prevention and Containment (Appendix B). All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. All equipment parked overnight shall be at least 100 feet from a watercourse or wetland, if possible. Equipment shall not be washed in streams or wetlands."

-Page Intentionally Left Blank-

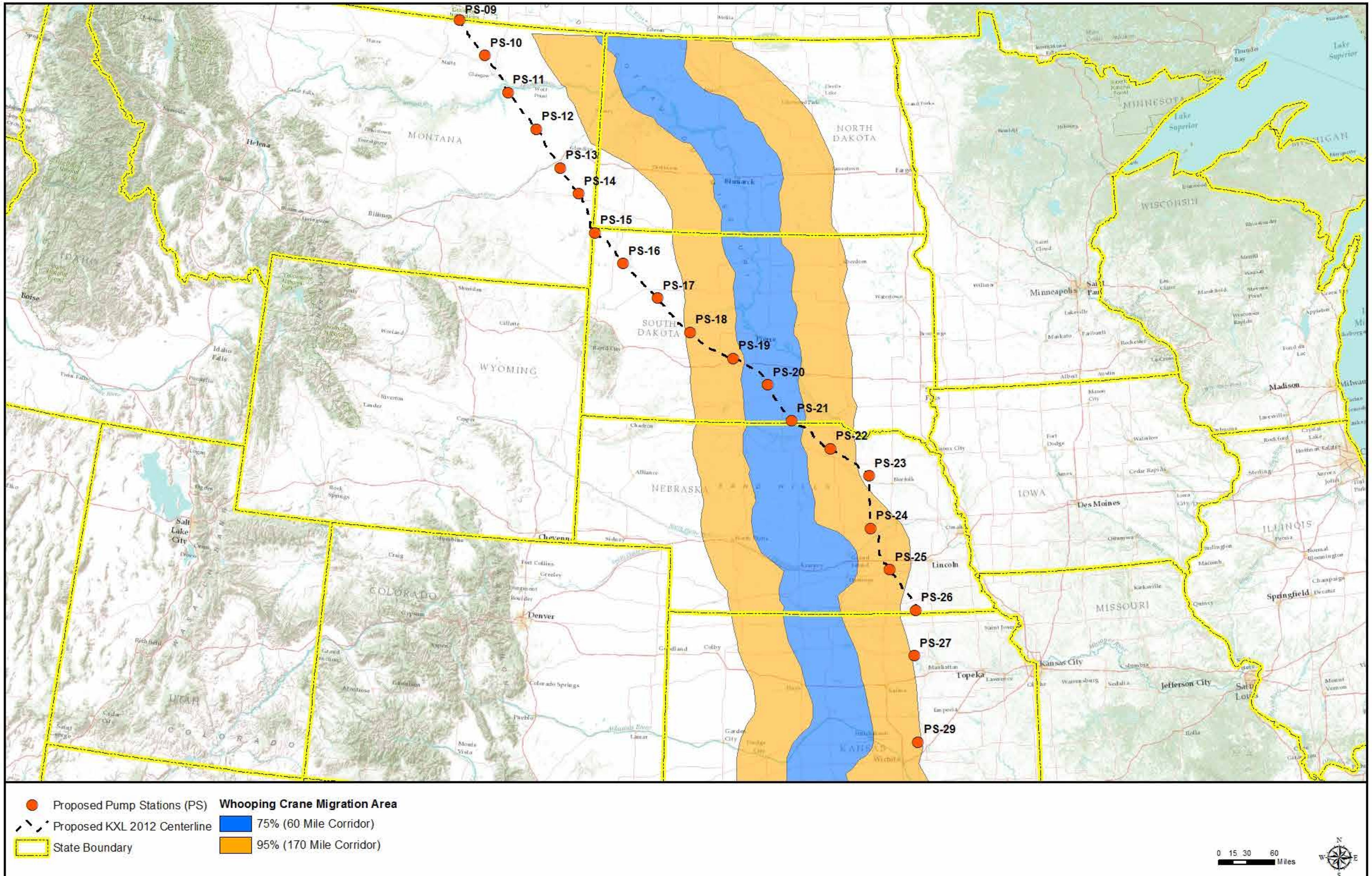


Figure 3.1.3-1 Central Flyway Whooping Crane Migration Corridor for the Aransas-Wood Buffalo Population

-Page Intentionally Left Blank-

Construction and restoration activities would be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. Each construction crew and cleanup crew would have on hand sufficient tools and materials to stop leaks including supplies of absorbent and barrier materials that would allow for rapid containment and recovery of spilled materials. The potential magnitude of spill effects varies with multiple factors, the most significant of which includes the amount of material released, the size of the spill dispersal area, the type of spill, the species assemblage present, climate, and the spill response tactics employed. Keystone has a detailed spill response plan prepared (Appendix D, SPCC Plan and ERP). Spill clean-up equipment and supplies will be secured before construction is initiated. All equipment refueling will be conducted at least 100 feet from a waterbody. Keystone would ensure that contractor's refueling staff are fully trained and understand the importance of adhering to restrictions to refueling operations near all waterbodies.

No direct impacts to the whooping crane are anticipated from the construction of the proposed Project. Suitable roosting and/or foraging habitats occur within the proposed Project area at major river crossings including the Yellowstone, Cheyenne, White, Niobrara, Loup, and Platte rivers. Habitats at these rivers would be crossed by HDD, so potential habitat loss, alteration, or fragmentation would be negligible. Minimal hand clearing of vegetation and limited human access would be required within the riparian areas of these rivers in order to use the HDD electronic guidance system (Tru-Tracker® cable) that is associated with the drilling equipment and in order to access these rivers to potentially withdraw water for the proposed Project's HDD and hydrostatic tests.

Any vegetation disturbance adjacent to suitable riverine habitat would be allowed to completely revegetate following construction. Based on the current migration pathway of this species, potential occurrence within or near the proposed Project area could occur but would be extremely rare and would be limited to a few individuals or small groups of migrant birds (CWS and USFWS 2007).

Indirect impacts could result from migrating individuals being disturbed and displaced due to noise, lighting from nighttime operations, and human presence during construction, if construction were to occur during spring or fall migrations. An estimated 36.54 miles of the 878-mile pipeline route lies within the whooping crane central flyway migration corridor, which is based on whooping crane sightings (See Figure 3.1.3-1, USFWS 2010). Of the pipeline route within this flyway migration corridor, an estimated 102.11 miles occurs within the center of the corridor where the majority (75 percent) of sightings have been documented (USFWS 2010). Any potential construction-related disturbance during the migration period would most likely occur within this 102.11 mile segment through Jones, Lyman, and Tripp counties in South Dakota, and Keya Paha County in Nebraska.

Water use is unlikely to affect the amount of roosting or foraging habitat along the rivers used by whooping cranes because Keystone proposes to use a small volume of water in comparison to the daily flow rate of the stream, and would return that water, with no additives or chemicals added, to the same source after hydrostatic testing if taken from the Platte River Basin. Indirect impacts to the whooping crane from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be considered negligible, based on Keystone's plan to return water back to its source within a 30-day period and the volume needed would be withdrawn at a rate less than 10 percent of the baseline daily flow.

Operations

Normal pipeline operation would not be expected to affect the whooping crane or habitats used during migration. Pipeline surveillance would involve routine low-level aerial over-flights 26 times per year at intervals no greater than every 3 weeks and/or ground based inspections once per year. Over-flights during migration periods would have the potential to disturb migrant whooping cranes. Most over-flights would normally be during late-morning or mid-day at an altitude of about 1,000 feet, although over-flights could occur at any time of day, and would be unlikely to disturb roosting or foraging cranes. Maintenance inspections that would require external pipeline examination would be unlikely to coincide with crane roosting or foraging habitats, but would have the potential to disturb migrant cranes.

Roosting habitats at rivers crossed by the HDD method would typically have 20 feet or more of overburden between the pipeline and river bottom. Therefore, heat dissipated from the pipeline would not affect riverine roosting habitats.

Direct contact with a crude oil spill could result in adverse effects to whooping cranes due to plumage oiling and crude oil ingestion from contaminated plumage and prey. While these exposure risks have the potential to cause adverse effects to individuals, the probability of adverse effects to whooping cranes are unlikely due to the low probability of a spill, low probability of the spill coinciding with the presence of migrating whooping cranes or migration habitats, and low probability of a whooping crane contacting the spilled product (see Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis).

Based upon a 102.11 mile pipeline segment that passes through the whooping crane flyway migration corridor and an incident spill risk of 0.00025 incident/ mile-year as described in Section 4.14 of the draft Supplemental Environmental Impact Statement, the estimated spill risk occurrence within the flyway migration corridor is 39 years or 0.026 incidences per year. Spill volume cannot be predicted; however, because 80% of historical spill volumes are less than 50 barrels (bbls), the probable spill volume could be less than 50 bbls which could result in a radial impact from the pipeline of up to 112 feet (34.1 meters) (U.S. Department of State 2012).

In the unlikely event of a pipeline leak, the crude oil would need to penetrate this significant amount of overburden before reaching the river, thereby reducing the risk of crude oil reaching the river and thereby reducing the potential for whooping crane exposure. Additionally, the major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR Part 195). Further, if a significant spill event were to occur, federal and state laws would require clean up.

Power Lines and Substations

Power lines associated with the proposed Project are collision hazards to migrant whooping cranes. Recent studies conducted by the USFWS in conjunction with University of Nebraska researchers have documented migratory bird mortalities, including cranes, from collisions with two existing 69-kV transmissions lines that cross the Platte River (Murphy et al. 2009; USFWS 2009a; Wright et al. 2009). One study conducted during the spring whooping crane migration in 2007 estimated that between 165 and 210 sandhill cranes did not survive collisions with the two power lines (Wright et al. 2009). No evidence of whooping crane mortality was observed during that study. Bird diverter devices (such as FireFly™ bird diverters) may reduce crane collisions and mortality from power lines by alerting cranes to the presence of power lines in their flight path (Murphy et al. 2009).

The construction of new electrical power line segments, especially those across riverine roosting habitats (e.g., Platte River in Nebraska), wetland roosting habitats, or between roosting habitat and nearby foraging habitat including wetlands and grain fields would incrementally increase the collision hazard for migrating whooping cranes because a portion of the proposed Project area is located within the flyway migration corridor for this species. A total of 0.75 mile of emergent wetlands and 0.08 mile of riverine/open water habitats would be crossed by distribution lines to pump stations within states where power distribution lines for pump stations are within the flyway migration corridor (Table 3.1-2).

Table 3.1-2 Wetlands Crossed by Transmission Lines within the Central Flyway Whooping Crane Migration Corridor[a]

State	Vegetation Community Classification	Length of Wetlands Crossed[b] (miles)	Wetland Area Affected during Construction (acres)	Wetland Area Affected during Operation (acres)
Montana	No wetlands within flyway	--	--	--
South Dakota	Palustrine Emergent Wetlands	0.75	16.16	8.65
	Palustrine Forested Wetlands	0.08	0.83	0.51
Nebraska	TBD[c,d]	TBD[c,d]	TBD[c,d]	TBD[c,d]

[a] Wetlands identified is based on transmission lines crossing within the whooping crane central flyway migration corridor.

[b] Length of the wetlands crossed was calculated by how much of the transmission line crossing was within the whooping crane migration corridor.

[c] Nebraska route at this point in time does not have transmission lines identified.

[d] Transmission line locations and potential impacts will be addressed after approval of the route by NDEQ and Department.

Additional facilities such as power lines required for the pump stations, remotely operated valves, and densitometers would require permits from appropriate agencies and would be installed and operated by local power providers and not by Keystone. A summary of impacts associated with the power line installations is contained in the September 7, 2012 TransCanada Keystone XL Pipeline Project Environmental Report, Section 6, Electrical Power Lines (exp Energy Services Inc. 2012).

Preliminary information on the design, construction, and operation of electrical transmission lines is presented below. Although the permit applications for these projects would be reviewed and acted on by other agencies, the potential impacts of these projects have been analyzed in the Supplemental EIS based on currently available information and are addressed within each resource assessed in the Supplemental EIS Chapter 4, Environmental Consequences. However, in some cases only limited information was available on the design, construction, and operation of the projects. The reviews of permit applications by other agencies would include more detailed environmental reviews of the connected actions.

An analysis of suitable migration stop-over habitat (e.g., large waterbodies, wetlands, and associated agricultural fields) in relation to the preliminary routes for associated transmission lines identified multiple locations within the flyway migration corridor where new transmission lines for 8 pump stations fall within the 75 percent or 95 percent whooping crane migration corridors (USFWS 2010) including:

- PS-18 Haakon County, SD (95 percent)
- PS-19 Haakon County, SD (95 percent)
- PS-20 Tripp County, SD (75 percent)
- PS-21 Gregory/Tripp, SD (75 percent)
- PS-22 Holt, NE (95 percent)
- PS-24 Nance, NE (95 percent)
- PS-25 Fillmore, NE (95 percent)
- PS-29 Butler, KS (95 percent)

Protection measures that could be implemented by electrical service providers first include avoidance and then minimization measures to prevent collision risk to migrating whooping cranes. Standard measures are outlined in *Mitigating Bird Collision with Power Lines* (APLIC 1994). Electrical power line providers are responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments to construct new power lines necessary to operate the proposed Project. Keystone would advise electrical power providers of their ESA consultation requirements with the USFWS for the electrical infrastructure components constructed for the proposed Project to prevent impacts to whooping cranes.

Cumulative Impacts

The proposed Project could potentially affect four migratory birds within their migration range from Nebraska to Montana and/or within their breeding habitats. Conservation measures proposed for three of these birds (i.e., whooping crane, piping plover, and interior least tern) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize effects to these birds.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for four federally protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds, including the greater sage-grouse (although not a migratory bird), interior least tern, piping plover, and Sprague’s pipit.

The whooping crane may experience long-term impacts associated with riparian areas that may be used for roosting and feeding. The use of the HDD method at major river crossings would reduce the probability of roosting and feeding habitat loss or alteration. In other areas along the corridor, revegetation (particularly within riparian zones and in wetland habitats) would reduce habitat impacts. The regeneration of revegetated areas may be slow which may cause long-term roosting and feeding habitat loss. Future projects in the area that reduce and fragment preferred roosting and feeding habitat for the whooping crane may provide the potential for additive cumulative effects to this species. Incremental impacts to streams and riparian habitats from future linear project construction and the accidental spread of exotic aquatic invasive plants and animals could increase cumulative impacts to threatened and endangered species habitat.

The central flyway whooping crane migration corridor overlaps with the proposed Project in South Dakota, Nebraska, and Kansas (Figures 2.2.3-1 and 2.2.3-2). Cumulative impacts to the whooping crane associated with the concurrent construction of the TransCanada Gulf Coast pipeline project are also considered. That project overlaps with the flyway migration corridor of the whooping crane in northern Oklahoma only; if construction periods between the TransCanada Gulf Coast pipeline project overlap with the proposed Project, they would likely do so for a short period of time only. Based on geographic proximity and the implementation of mitigation and restoration measures to address riparian habitat impacts, cumulative impacts to the whooping crane are not anticipated.

Impacts to federally protected and candidate species from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term or permanent. The greater sage-grouse, Sprague's pipit, and federally protected species may be impacted by habitat loss resulting from construction of the Bakken Marketlink Project, along with future projects in the area that reduce and fragment preferred habitat for these species. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on these species. The Bakken Marketlink facilities near Baker, Montana would not likely affect the whooping crane, as this region is not within the flyway migration corridor. Operation of the proposed Big Bend to Witten 230-kV transmission line in southern South Dakota may increase the collision hazards for migrating whooping cranes, which could adversely affect populations of this species.

3.1.3.4 Conservation Measures

The following conservation measures, based on consultation with the USFWS, would apply if pipeline construction-related activities were to occur in close proximity to migrating whooping cranes:

- During spring and fall whooping crane migration periods, environmental monitors would complete a brief survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC (USFWS 2012b). If whooping cranes are sighted the environmental monitor would immediately contact the USFWS and respective state agency in Nebraska, South Dakota, North Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager would record the sighting, bird departure time, and work start time on the survey form. The USFWS would notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program.

- Lights would be down-shielded should HDD occur at night during the spring and fall whooping crane migrations in areas that provide suitable habitat.

The following conservation measures would apply to power distribution lines to pump stations within the whooping crane migration route:

- Avoid overhead power line construction within 5.0 miles of suitable whooping crane roosting habitat and/or documented high use areas (locations may be obtained from local USFWS, Ecological Services Field Office).
- To the extent practicable, bury all new power lines, especially those within 1.0 mile of potentially suitable migration stopover habitat.

If it is not economically or technically feasible to bury the line, conservation measures to minimize or avoid impacts to migrating whooping cranes would vary depending on the circumstances, but may include the following:

- Within the 95-percent migration corridor: mark new lines within 1 mile of potentially suitable habitat and an equal amount of existing line within 1 mile of potentially suitable habitat within the identified migration corridors (at a minimum within the 75-percent corridor, preferably within the 95-percent corridor, Figure 3.1.3-1).
- Within the 95 percent migration corridor, install bird flight diverters to minimize the risk of collision.
- Outside the 95-percent migration corridor: mark new lines within 1 mile of potentially suitable habitat at the discretion of the local Ecological Services Field Office, based on the biological needs of the whooping crane.
- Develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition.

3.1.3.5 Determination

Effect on Critical Habitat

The proposed Project would not result in the destruction or adverse modification of federally designated critical habitat for the whooping crane. The area of designated critical habitat for the whooping crane in Nebraska is upstream from the Platte River crossing, and other critical habitat areas are well outside the proposed Project area.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" whooping cranes. This determination is based on the rarity of the species, its status as a migrant through the proposed Project area, Keystone's commitment to follow recommended conservation measures identified by the USFWS, and power providers will consult with the USFWS regarding ways to minimize or mitigate impacts to the whooping crane and other threatened and endangered species for new distribution lines to the pump stations (See Appendix A, Letters of Section 7 Consultation Commitments from Power Providers) and follow recommended avoidance and conservation measures of the USFWS. As a result, no direct impacts are expected to result from construction. Indirect impacts from disturbance of migrating whooping cranes during Project construction and hydrostatic testing are expected to be avoided and minimized through Keystone's commitment to follow recommended conservation measures identified by the USFWS.

Although it is possible that a large spill event could result in an adverse effect on this species and its migration habitat, the probability of adverse effects to whooping cranes are unlikely due to the low probability of a spill, low probability of the spill coinciding with the presence of whooping cranes or migration habitats, and low probability of a whooping crane contacting the spilled product.

3.1.4 Pallid Sturgeon - Endangered

3.1.4.1 Natural History and Habitat Association

The pallid sturgeon (*Scaphirhynchus albus*) was listed as endangered on September 6, 1990 (55 FR 36641). This species is native to the Missouri and Mississippi rivers and is adapted to habitat conditions in these large rivers prior to river modifications. Preferred habitat is described as large, free-flowing rivers with warm water, turbid habitat with a diverse mix of physical habitats that were in a constant state of change (USFWS 1993). Pallid sturgeon are adapted for living close to the bottom of large, shallow, silty rivers with sand and gravel bars. Adults and larger juveniles feed primarily on fish while smaller juveniles feed primarily on the larvae of aquatic insects (Wilson 2004).

Macrohabitat environments required by pallid sturgeon are formed by floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters within the large river ecosystem (USFWS 2012b). Prior to dam development along the Missouri and Mississippi rivers, these features were in a constant state of change. With the introduction of dams and bank stabilization, areas of former river habitat have been covered by lakes, water velocity has increased in remaining river sections making deep stretches of clear water, and water temperatures have significantly decreased. All of these factors are believed to have contributed to the decline in pallid sturgeon populations (USFWS 1993).

The pallid sturgeon has never been common since it was first described in 1905 and catch records and recovery and research efforts since that time have indicated a steady decline in this species (Wilson 2004). The historic range of this fish formerly included the Mississippi River (below its confluence with the Missouri River), the Missouri River, and the very lower reaches of the Platte, Kansas, and Yellowstone rivers near their confluence with the Missouri (USFWS 1993). According to the USFWS pallid sturgeon recovery plan (USFWS 1993), since 1980 reports of most frequent occurrence are from the Missouri River between the Marias River and Fort Peck Reservoir in Montana; between Fort Peck Dam and Lake Sakakawea (near Williston, North Dakota); within the lower 113 km (70 miles) of the Yellowstone River to downstream of Fallon, Montana; in the headwaters of Lake Sharpe in South Dakota; and from the Missouri River near the mouth of the Platte River near Plattsmouth, Nebraska. Although widely distributed, pallid sturgeon remain one of the rarest fish in the Missouri and Mississippi river basins. The pallid sturgeon has been found in recent years (2010 and 2011) in the Milk River in Montana from the Missouri River to the Vandalia Dam (Fuller and Haddix 2012).

Critical habitat has not been designated for the pallid sturgeon, but sections of rivers relatively unchanged by dam construction and operation that maintain large, turbid, free-flowing river characteristics are important in maintaining residual populations of this species. However, several areas have been designated as Recovery Priority Management Areas (RPMAs) in the species recovery plan (USFWS 1993, 2005) (Figure 3.1.4-1). The proposed Project crosses the Missouri, Yellowstone, and Milk rivers, which are located in pallid sturgeon RPMAs 1 and 2. RPMA 1 is from the Missouri River from the headwaters of Fort Peck Reservoir upstream to the confluence of the Marias River, Montana. RPMA 2 is from the Missouri River from Fort Peck Dam to the head waters of Lake Sakakawea, including the Yellowstone River upstream to the mouth of the Tongue River (USFWS 1993). The Milk, Missouri, and Yellowstone rivers would be crossed using the HDD method.

3.1.4.2 Potential Presence in Project Area

The potential for this species to occur within the proposed Project area exists at the crossing of the Milk River above the Fort Peck Reservoir, at the crossing of the Missouri River below Fort Peck Dam, and the crossing of the Yellowstone River downstream of Fallon, Montana. The Milk River proposed Project crossings is located in RPMA 1 for the pallid sturgeon and the Missouri and Yellowstone river crossings are located in RPMA 2. This species also occurs in the lower Niobrara River approximately 5 miles upstream from the confluence of the Missouri and Niobrara rivers, and the lower Platte River downstream from the proposed Project crossing generally in the river segment from the confluence of the Loup and Platte rivers to the confluence of the Platte and Missouri rivers.

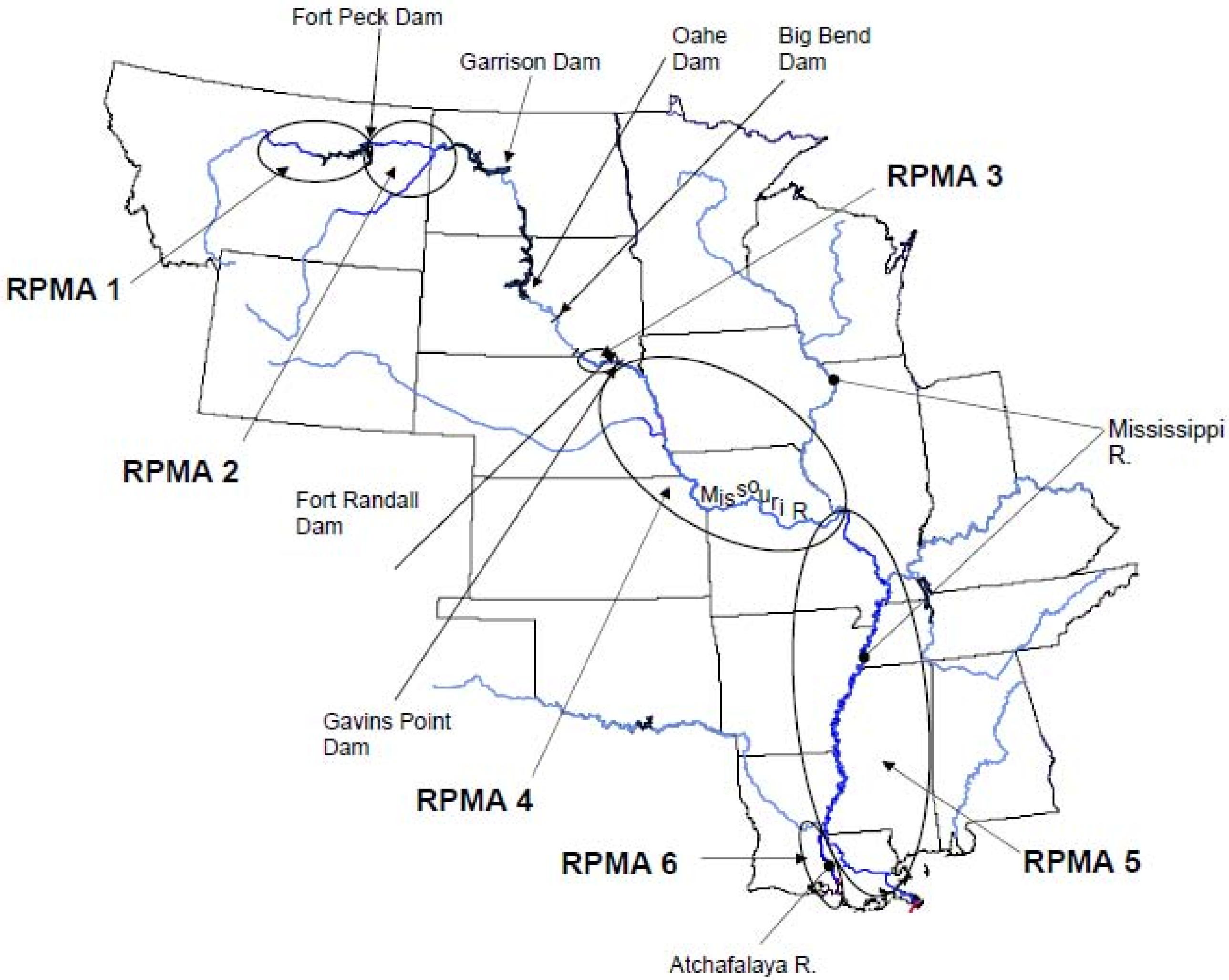
The pallid sturgeon is found in big river systems including the Missouri River and its major tributaries including the Yellowstone, Niobrara, and Platte rivers. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters form the large-river ecosystem that provides macrohabitat requirements for the pallid sturgeon, a species that is associated with diverse aquatic habitats. These habitats historically were dynamic and in a constant state of change due to influences from the natural hydrography, and sediment and runoff inputs from an enormous watershed spanning portions of 10 states.

Navigation, channelization and bank stabilization, and hydropower generation projects have caused the widespread loss of this diverse array of dynamic habitats once provided to pallid sturgeon in the Missouri River system. This has resulted in a precipitous decline in populations of the species. Surface water depletions to the Platte River system can also affect the pallid sturgeon.

3.1.4.3 Impact Evaluation

Construction

Suitable habitat and identified RPMAs within the Milk, Missouri and Yellowstone rivers crossed by the proposed Project in Montana would be crossed using the HDD method. Therefore, no direct impacts to pallid sturgeon habitat are expected to occur as a result of Project construction (USFWS 2008d). Although pallid sturgeon may be present at the crossings of the Milk, Missouri and Yellowstone Rivers, because these river crossings would be crossed using the HDD method, there would be no direct effect on potential river bottom habitat for pallid sturgeon. It would be unlikely that the proposed Project crossings at the Platte and Niobrara rivers would have a negative effect on pallid sturgeon in Nebraska given the lack of suitable habitat, flow, and a river impediment (Spencer Dam) at those crossing sites and that both of these rivers would be crossed using the HDD method.



Source: USFWS 2005.
Note: Map not to scale.
Note: Outlined areas (ovals) correspond with approximate location of Recovery Priority Management Areas (RPMAs) as defined in the Pallid Sturgeon Recovery Plan (USFWS 1993).

Figure 3.1.4-1 Pallid Sturgeon Priority Management Recovery Area

-Page Intentionally Left Blank-

At streams and rivers crossed by the HDD method, a pump and hose would be placed in the waterbody to provide water to the HDD operation. The intake end of this pump would be screened using an appropriate mesh size to prevent entrainment or entrapment of larval fish or other aquatic organisms. The withdrawal rates for the pumps would be designed to reduce the potential for entrainment or entrapment of aquatic species. Many of the HDD installations would take place early in the construction period, potentially during the pallid sturgeon spawning period. However, the combination of effective screening and controlled water withdrawal rates would reduce the potential to impact the species.

The Missouri, Yellowstone, and Platte rivers have been identified as water sources to be used for pipeline hydrostatic testing. During this testing process, a pump would be placed in or adjacent to the river for the duration of the water intake and filling period. As for the HDD method, the intake end of the pump would be screened with appropriate mesh size to prevent entrainment of larval fish or debris. All water pump intake screens would be periodically checked for entrainment of fish. Should a sturgeon become entrained, all pumping operations would cease immediately and the Compliance Manager for Keystone would immediately contact the USFWS to determine if additional protection measures would be required. Care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks to avoid impacts to spawning habitat for the species. Hydrostatic test discharge would be in upland locations near the source of the water. Water would be discharged over several days and through a hay bale to filter the water and not directly into the source (see Appendix B, CMRP, Section 8.4, Dewatering the Pipeline).

During droughts, surface water withdrawal permits from larger rivers with existing water rights (e.g., Platte River) would be regulated by state regulatory agencies to preserve existing water rights and environmental requirements. If inadequate water is available from rivers, Keystone would use alternative water sources nearby such as local private wells or municipal sources for HDD operations, hydrostatic testing the mainline, and dust control during dry conditions. Keystone has indicated that in the event surface water is unavailable, groundwater would be used for HDD operations, hydrostatic testing, and dust control. Water would be purchased from nearby willing sellers and would not increase overall groundwater use.

Platte River basin water depletions in Nebraska may affect pallid sturgeon habitats by reducing the amount of water available for this species in the lower Platte River. Impacts to the pallid sturgeon from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided, based on Keystone's plan to withdraw the volume needed at a rate less than 10 percent of the baseline daily flow and to return water back to its source within a 30-day period.

Operations

Routine pipeline operations are not expected to affect the pallid sturgeon. Pump Station 11 is nine miles away from the Missouri River and would have one incandescent light above the station door of the electrical building that is unlikely to have an effect on the river at night.

The Milk, Missouri and Yellowstone rivers in Montana would be crossed by HDD which would result in a burial depth of 25 feet or greater from the bottom of the river. In the highly unlikely event that a leak occurs in the pipeline, the crude oil would need to penetrate a significant amount of overburden before reaching the river, thereby reducing the risk in some cases of crude oil reaching the river and the potential for exposure. Additionally, the Missouri and the Yellowstone rivers also are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195). Further, if a significant spill event were to occur, federal and state laws would require clean up.

During HDD construction, an accidental release of pressurized drilling mud from the borehole, or *frac-out,* could potentially occur. In some instances, the pressurized fluids and drilling lubricants may escape the active bore, migrate through the soils, and come to the surface at or near the construction site. Most leaks of HDD drilling fluids occur near the drill entry and exit locations and are quickly contained and cleaned up.

Frac-outs that may release drilling fluids into aquatic environments are more difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. While the HDD method poses a small risk of frac-out, potential releases would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings that the pipeline contractor prepares prior to construction. These practices include monitoring the directional drill, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.

In the unlikely event of a spill that would enter a river, exposure to crude oil could result in adverse toxicological effects to pallid sturgeon. However, the probability of adverse effects to pallid sturgeon are unlikely due to the low probability of a spill, low probability of a spill in a river reaching where pallid sturgeon are present, and low probability of the spill reaching a river with pallid sturgeon in sufficient amounts to cause toxic effects (See Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis).

3.1.4.4 Cumulative Impacts

Incremental impacts to streams and riparian habitats from future linear project construction and the accidental spread of exotic aquatic invasive plants and animals could increase cumulative impacts to threatened and endangered species habitat. Introduced non-native species can compete with native species and transmit diseases (e.g., whirling disease) that could adversely impact pallid sturgeon. Invasive aquatic species (either plant or animal) can be introduced into waterways and wetlands and can be spread by improperly cleaned vehicles and equipment operating in water, stream channel, or wetlands (Cowie and Robinson 2003, Fuller 2003).

Overall, considerations such as fish life history stage timing, construction impact mitigation, site-specific crossing techniques, seasonal conditions, contingency plans, water quality testing, and water quality compliance would result in the proposed Project having low potential to adversely affect recreationally or commercially important fisheries as a result of construction and normal operation. Existing pipelines, active and abandoned mining sites, Williston basin oil and gas fields, and landfill sites are not noted to have had long-term impacts to fisheries with respect to invasive species. However, mitigation and restoration measures are available to address these concerns within the context of all of these project activities, thus the overall significance to cumulative impacts is low.

3.1.4.5 Conservation Measures

The Project proposes to implement HDD under the Milk, Missouri and Yellowstone rivers. The USFWS recommends that the proposed pipeline crossing be bored beneath channel beds at depths sufficient to prevent scour exposure and potential rupture to avoid impacts to pallid sturgeon and its habitat. As described earlier, the intake end of the pump would be screened to prevent entrainment of larval fish or debris and the intake screens would be periodically checked for fish entrainment. Should a sturgeon become entrained, all pumping operations would immediately cease and the compliance manager for Keystone would immediately contact the USFWS to determine if additional protection measures would be required. Water used for hydrostatic testing is not chemically treated and would be returned to the source.

At least a 100-foot setback from the water's edge for the HDD drill pads would be used at the HDD crossings at the Milk, Yellowstone and Missouri rivers in Montana.

3.1.4.6 Determination

Effect on Critical Habitat

Critical habitat has not been designated for the pallid sturgeon. Therefore, the proposed Project would not result in the destruction or adverse modification of critical habitat for the species. However, the proposed Project would cross the Milk, Missouri and Yellowstone rivers in Montana, identified as RPMAs 1 and 2 for the pallid sturgeon. Implementation of the aforementioned conservation measures and using the HDD method to cross these rivers would avoid negative impacts to these RPMAs.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" the pallid sturgeon. This determination is based on Keystone's plan to use the HDD crossing method for the Milk, Missouri and Yellowstone rivers and Keystone's commitment to follow recommended conservation measures of the USFWS. Some of the recommended mitigation measures to protect pallid sturgeon may include the use of HDD drilling technique including buffers for drill pads, HDD contingency plans, including a frac-out spill plan, use of nontoxic additives during the course of HDD, use of approved screens for temporary surface water withdrawals and minimizing surface water withdrawals from smaller streams for hydrostatic testing during dry or drought conditions.

Although it is possible that a spill event could result in an adverse effect on this species, the probability of such an event would be unlikely due to the low probability of a spill, low probability of a spill in a river reaching where pallid sturgeon are present, and the low probability of the spill reaching a major river with pallid sturgeon in sufficient amounts to cause toxic effects. In the unlikely event of a leak, the crude oil would need to penetrate a significant amount of overburden before reaching the river, thereby reducing the risk in some cases of crude oil reaching the river and the potential for exposure.

3.1.5 American Burying Beetle - Endangered

3.1.5.1 Natural History and Habitat Association

The American burying beetle (*Nicrophorus americanus*) was federally-listed as e*ndangered o*n July 13, 1989 (54 FR 29652). The American burying beetle has historically been recorded in 35 states in the eastern and central United States. Populations declined from the 1920s to the 1960s and the American burying beetle is currently found only at the peripheries of its former range. In 1983 the American burying beetle was included as an endangered species in the Invertebrate Red Book published by the International Union for the Conservation of Nature (ENSR 2008).

The American burying beetle is the largest carrion-feeding insect in North America reaching a length of about 4 cm and a weight of up to 3 grams. Like other carrion beetles, American burying beetles search the environment for fresh carcasses which they use for feeding and rearing of offspring (Milne and Milne 1976; USFWS 2012b).

Considering the broad geographic range formerly occupied by the American burying beetle, it is unlikely that vegetation or soil type were historically limiting. Unlike other burying beetles, no strong correlation with vegetation or soil type seems to exist (Creighton et al. 1993, Jurzenski et al. 2011). American burying beetles appear to decline in response to habitat fragmentation and increases in row crop agriculture (Bishop et al. 2002). There are no comprehensive life history studies that provide information on exactly where beetles overwinter (depth in soil, whether frozen or unfrozen locations used) or the exact cues for American burying beetle emergence from the ground (soil temperature, soil moisture, combinations, other).

Based on their historical wide ranging distribution and occurrence in northern states where soil temperatures decline to below freezing during winter, Dr. Wyatt Hoback, who has studied the American burying beetle for more than 10 years, considers that American burying beetles likely have adapted an overwinter survival strategy that requires either freezing or cooling, to very near freezing, that slows metabolism to a point that fat reserves are sufficient to last overwinter until emergence in late May or early June (Hoback, personal communication).

The primary causes for the decline of the American burying beetle are thought to be pesticide use and habitat loss, degradation, and fragmentation, which correspond to a decrease in the availability of suitable carrion (Bedick et al. 1999; Jurzenski 2012). Developed land and land that has been converted from agricultural, grazing, and other uses, often favors scavenging mammals and birds that compete with carrion beetles for carrion. Additionally, these types of habitat alterations have generally led to declines in ground nesting birds, which probably historically provided a large portion of the carrion available.

Fire suppression in prairie habitats allows the encroachment of woody plant species, particularly the eastern red cedar (*Juniperus virginiana)*, which is thought to degrade habitat for burying beetles by limiting their range to forage for carrion. The red-imported fire ant (*Solenopsis invicta*), which has extended its range in the southeastern and south central United States and is most numerous in open, disturbed habitat, has also been identified as a cause for the decline of the American burying beetle (USFWS 2008f).

Like other carrion beetles, American burying beetles search the environment for fresh carcasses which they use for feeding and rearing of offspring. Because carrion is a typically limited resource, the discovery of a carcass often occurs within two days, but has been reported to occur as quickly as 35 minutes post-death (Milne and Milne 1976). Usually, multiple individuals comprising several species discover the carcass. As the beetles arrive at the carcass, a fierce competition erupts. This competition can lead to damage to beetles including loss of legs, antennae, and even mortality (Bedick et al. 1999).

If the carcass is fresh and is of appropriate size, competition ensues until there is only a single beetle pair occupying the carcass. This pair is generally the largest male and female of the largest species that discovered the carcass with the other beetles either being driven away or being wounded by the victorious pair and not surviving (Wilson and Fudge 1984). The victorious pair will then work cooperatively to quickly entomb the acquired carcass. This behavior seems to have evolved out of necessity to remove the carcass from the realm of discovery by other invertebrate burying beetles as well as vertebrate scavengers. Studies have demonstrated that there is an intense competition between flies and ants for the resources present in the carcass (Scott 1998). If flies discover and reproduce on the carcass before burying beetles arrive, the developing fly larvae can quickly consume all the nutrients within the carcass effectively eliminating the carcass as a reproductive resource for the beetles. If the carcass is discovered by ants, adult beetles must fend them away and sometimes become victims of aggressive ant colonies (Ratcliffe 1996).

After finding a suitable burial locality, the parental beetles will begin plowing under the carcass creating a compacted depression that will become the final resting place for the carcass. As the carcass falls into the depression through the action of gravity, it is forced into a tight ball by the beetles. The carcass is further molded into a tight ball as the beetles move over the carcass and remove the fur or feathers (Milne and Milne 1976).

3.1.5.2 Potential Presence in Project Area

In Nebraska, the American burying beetle has been observed from April 1 to October 29, with peak periods of activity extending from June through August. Generally, July is a time when adults go underground to reproduce and cannot be captured during surveys at that time. Beetles overwinter as adults. Burying beetles likely feed on roadkill found along South Dakota and Nebraska roadways. The species has been found in mesic areas such as wet meadows, streams, and wetlands in association with relatively undisturbed semi-arid, sandhill and loam grasslands. Such areas have been observed to have a thick stand of grassland vegetation with some woody vegetation. Soils composed of some clay with a prominent duff (litter) layer have also been observed at these sites.

The American burying beetle is found in Tripp, Todd, and Gregory counties in South Dakota. In Nebraska, American burying beetle populations are known to occur in Antelope, Blaine, Boone, Brown, Cherry, Custer, Dawson, Frontier, Gasper, Holt, Keya Paha, Lincoln, Loup, Rock, Thomas, Valley, and Wheeler counties and may occur elsewhere in Nebraska (Figure 3.1.5-1).

The proposed Project would result in approximately 500 miles of pipeline construction through South Dakota and Nebraska. Reconnaissance surveys of habitat suitability along the pipeline ROW for South Dakota and Nebraska were conducted from 2008 to 2012 and habitat was rated based on the Nebraska habitat rating system that reflects the potential for American burying beetle occurrence based on general habitat characteristics (Hoback 2010, 2012, Figure 3.1.5-2). The entire proposed Project ROW and off ROW work areas such as construction yards, construction camps, pump stations, and pipe yards were rated using this system.

-Page Intentionally Left Blank-

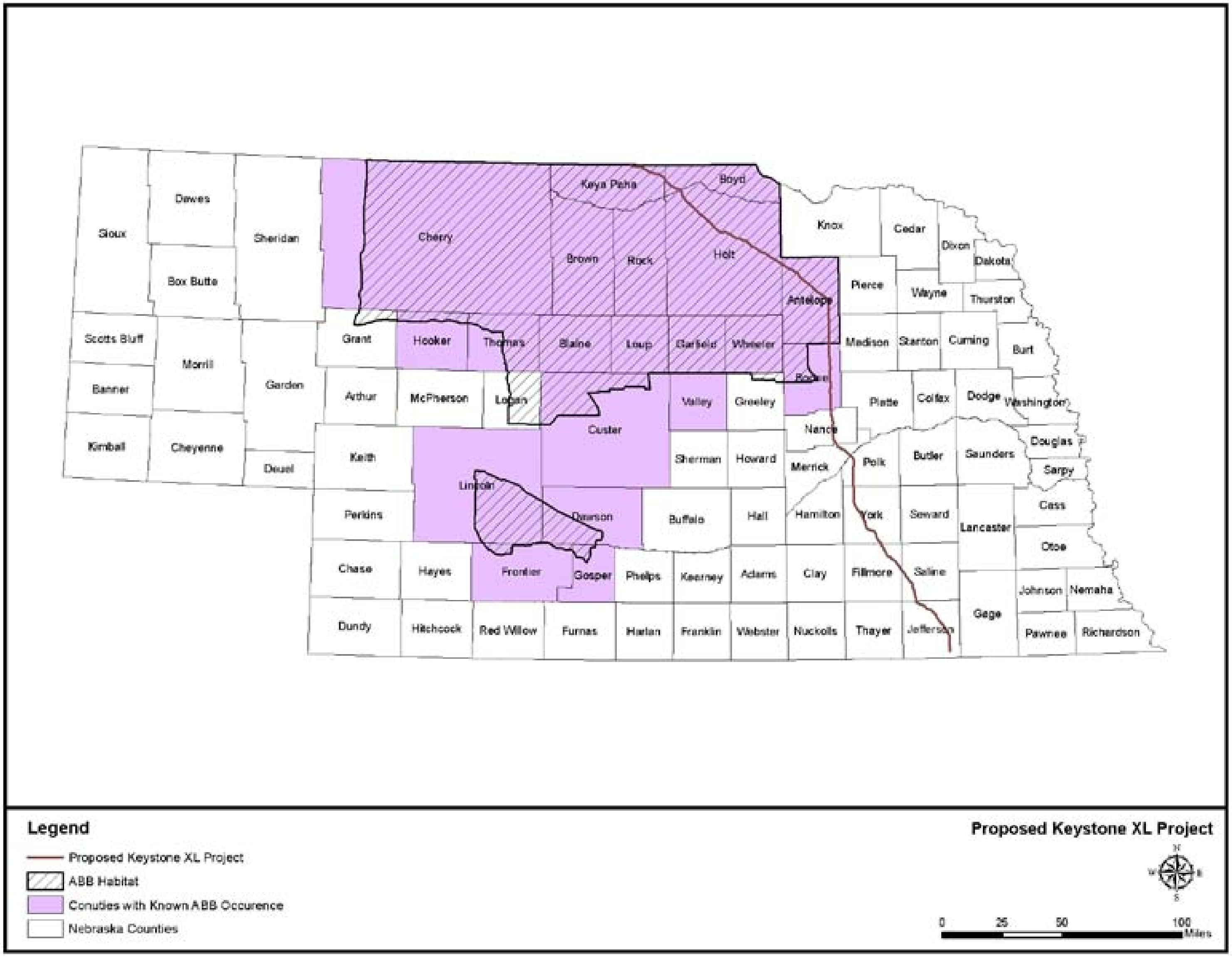


Figure 3.1.5-1 American Burying Beetle habitat and occurrence in Nebraska (USFWS Ecological Field Services Office, Grand Island, Nebraska).

-Page Intentionally Left Blank-

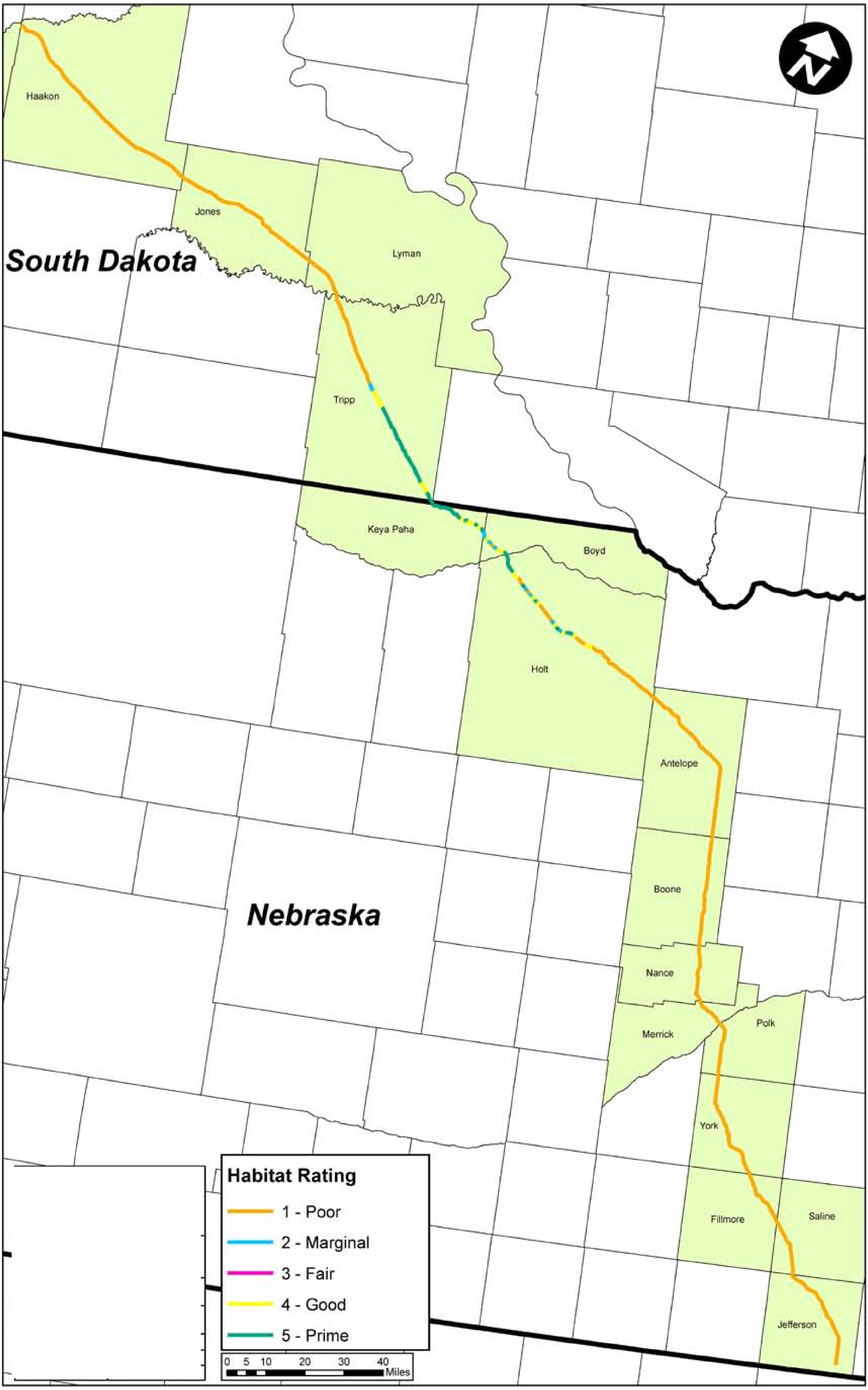


Figure 3.1.5-2 American Burying Beetle habitat ratings in South Dakota and Nebraska.

-Page Intentionally Left Blank-

The following habitat rating criteria were used in Nebraska and were also used for habitat designations in South Dakota:

> 5. *Prime:* Undeveloped wet meadows with some trees, especially cottonwoods (*Populus deltoides*), or forest areas visible. Water sources are available including the presence of a river, stream, or sub-irrigated soils (water is close to the surface as a result of shallow aquifer). Cropland is not visible within the mile segment, or is more than 2 miles away.
>
> 4. *Good:* Native grassland species (tall or mixed grass prairie) with forbs. Low wetland meadows that are grazed by cattle or used for haying. Trees, usually cottonwoods, present. Sources of water are within 1 mile, but the area has either some cropland or sources of light pollution including yard lights, or houses within 1 mile.
>
> 3. *Fair:* Grassland with exotic species such as brome grass (*Bromus* spp.). Soil moisture content is lower than for prime or good habitat. Row crop agriculture is located within 1 mile.
>
> 2. *Marginal:* Potential habitat restricted to one side of the pipeline ROW, with row crop agriculture on one side or dry, sandy, upland areas with exposed soil and scattered dry-adapted plants such as yucca (*Yucca* spp.).
>
> 1. *Poor.* Both sides of the pipeline ROW with row crop agriculture or habitat with the potential for large amounts of light pollution and disturbance associated with town or city edge.

South Dakota

American burying beetles have been recently collected from three South Dakota counties: Todd, Tripp, and Gregory (Backlund and Marrone 1997). Surveys in 2005, revealed that burying beetles are concentrated in Tripp County where the population is estimated to be approximately 1,000 individuals in an area of approximately 220 square kilometers (54,363 acres) in southern Tripp County (Backlund et al. 2008). The best habitat for the burying beetles in South Dakota is similar to that of the northern Nebraska population and consists of wet meadows in sandy soils with scattered cottonwoods trees (*Populus deltoids*). The proposed Project would cross approximately 35 miles of American burying beetle habitat that is either classified as prime, good, fair, and marginal. As shown in Table 3.1-3, 220 acres of American burying beetle habitat in South Dakota would be permanently impacted from various proposed Project facilities (160 acres prime, 48 acres good, 0 acres fair, and 12 acres marginal). Temporary impacts to American burying beetle habitat from proposed Project construction activities in South Dakota would be 408 acres. Of the acres impacted, approximately 208 acres of prime and good habitat would be permanently impacted from various proposed Project facilities, and 310 acres of prime and good habitat would be temporarily impacted from Project facilities in South Dakota. American burying beetles are unlikely to occur in fair, marginal, or poor habitat.

Thermal modeling, discussed below, indicates that pipeline operation would have thermal effects in an area above the pipeline in the northern portions of the American burying beetle's range and that thermal effects may include an area out to 11 feet on either side of the pipeline (22-foot wide area). This estimated 22-foot-wide area would experience potential permanent thermal effects which would result in this area remaining above freezing during portions of the American burying beetle over-wintering period which could affect overwintering beetles by increasing their metabolic demand and reducing survival and productivity (Table 3.1-3). The area stabilized by gravel platforms for the above-ground facilities would result in an estimated 10 acres of permanent impact to prime and good habitats that would also be likely to support American burying beetles (Table 3.1-3).

Table 3.1-3 South Dakota American Burying Beetle Habitat Suitability Acreage

Permanent Impact	Poor	Marginal	Fair	Good	Prime
Permanent Easement (CL ROW[a])	0.00	12.13	0.00	48.50	150.32
Pump Stations	0.00	0.00	0.00	0.00	8.42
Permanent Access Road Easement	0.00	0.00	0.00	0.00	1.27
Total Acres	**0.00**	**12.13**	**0.00**	**48.50**	**160.01**
Temporary Impact					
Temporary Easement (CL ROW)	0.00	14.17	0.00	57.84	179.07
Additional Temporary Workspace (CL ROW)	0.00	3.37	0.00	10.80	30.91
Auxiliary Site	0.00	0.00	80.01	0.00	29.50
Temporary Access Road Easement	0.00	0.20	0.00	0.00	2.28
Total Acres	**0.00**	**17.74**	**80.01**	**68.64**	**241.75**

[a] CL ROW = centerline of the right-of-way.

In South Dakota, American burying beetles are known to occur south of State Highway 18 in the southern half of Tripp County (Backlund et al. 2008).

Suitability ratings of American burying beetle habitat crossed by the proposed Project in South Dakota are provided in Table 3.1-4 and Figure 3.1.5-2.

Proposed pipeline corridor adjustments were made in South Dakota during the Nebraska reroute planning and analysis. As shown in Table 3.1-4 below, the adjusted proposed route in South Dakota would impact about 25 miles of prime habitat, 8 miles of good habitat, and 2 miles of marginal habitat.

Table 3.1-4 Suitability Ratings of American Burying Beetle Habitat in Route Modifications in South Dakota

County	MP	Prime	Good	Fair	Marginal	Poor	Notes
Tripp	566				x		Agricultural lands with creek bottoms
Tripp	567				x		Agricultural lands with creek bottoms
Tripp	568		x				Grassland Transition Zone
Tripp	569		x				Grassland Transition Zone
Tripp	570		x				Grassland Transition Zone
Tripp	571		x				Grassland Transition Zone
Tripp	572		x				Grassland Transition Zone
Tripp	573	x					Soil changes to sandy loam, drier
Tripp	574	x					Sub-irrigated Meadows
Tripp	575	x					Sub-irrigated Meadows

County	MP	Prime	Good	Fair	Marginal	Poor	Notes
Tripp	576	x					Sub-irrigated Meadows
Tripp	577	x					Sub-irrigated Meadows
Tripp	578	x					Wet meadows
Tripp	579	x					Sub-irrigated Meadows
Tripp	580	x					Sub-irrigated Meadows
Tripp	581	x					Sub-irrigated Meadows
Tripp	582	x					Sub-irrigated Meadows
Tripp	583	x					Sub-irrigated Meadows
Tripp	584	x					Sub-irrigated Meadows
Tripp	585	x					Sub-irrigated Meadows
Tripp	586	x					Sub-irrigated Meadows
Tripp	587	x					Includes pump yard 20 site 1
Tripp	588	x					Sub-irrigated Meadows
Tripp	589	x					Sub-irrigated Meadows
Tripp	590	x					Sub-irrigated Meadows
Tripp	591	x					Sub-irrigated Meadows
Tripp	592	x					Sub-irrigated Meadows
Tripp	593	x					Sub-irrigated Meadows
Tripp	594	x					Sub-irrigated Meadows
Tripp	595		x				Upland, sandier, drier, hayed
Tripp	596		x				Upland, sandier, drier
Tripp	597		x				Upland, sandier, drier
Tripp	598	x					Includes area for pump station-21 and access road
Tripp	599	x					Sub-irrigated Meadows
Tripp	600	x					NE border
Total Miles		**25**	**8**	**0**	**2**	**0**	

Nebraska

As shown on Table 3.1-5, approximately 372 acres of American burying beetle habitat would be permanently impacted in Nebraska from the proposed Project. Of the 372 acres impacted, about 140 acres are considered prime habitat, 97 acres good, 0 acres fair, and 63 acres marginal.

Table 3.1-5 Estimated American Burying Beetle Habitat Acreage Impacts in Nebraska

Permanent Impact	Poor	Marginal	Fair	Good	Prime
Permanent Easement (CL ROW)	72.73	48.48	0.00	96.51	139.70
Pump Stations	0.05	14.99	0.00	0.00	0.00
Permanent Access Road Easement	0.00	0.00	0.00	0.00	0.00
Total Acres	**72.78**	**63.47**	**0.00**	**96.51**	**139.70**
Temporary Impact					
Temporary Easement (CL ROW)	87.27	56.51	0.00	115.73	165.02
Additional Temporary Workspace (CL ROW)	5.63	3.84	0.00	9.75	16.64
Auxiliary Site[a]	104.62	30.10	0.00	33.36	90.65
Temporary Access Road Easement[a]	0.00	5.08	13.44	13.70	15.02
Total Acres	**197.52**	**95.53**	**13.44**	**172.54**	**287.34**

[a] Includes potential site locations in Spread 8.

CL ROW = centerline of right-of-way.

American burying beetles occur in two Nebraska regions. They occur in the loess canyons in the south, and in the Sandhills. This northern population of American burying beetles is concentrated in Holt, Garfield, and Rock counties. A preliminary range map was recently developed based on presence of American burying beetles from previous studies in Nebraska and a windshield survey to categorize suitable habitat based on land use (Figure 3.1.5-3, and 3.1.5-4 [Jurzenski and Hoback 2010]).

Suitability ratings of American burying beetle habitat crossed by the proposed Project in Nebraska are provided in Table 3.1-6 and Figure 3.1.5-2. As shown in Table 3.1-4 below, the adjusted proposed route in Nebraska would impact about 23 miles of prime habitat, 16 miles of good habitat, 8 miles of marginal habitat, and 12 miles of poor habitat.

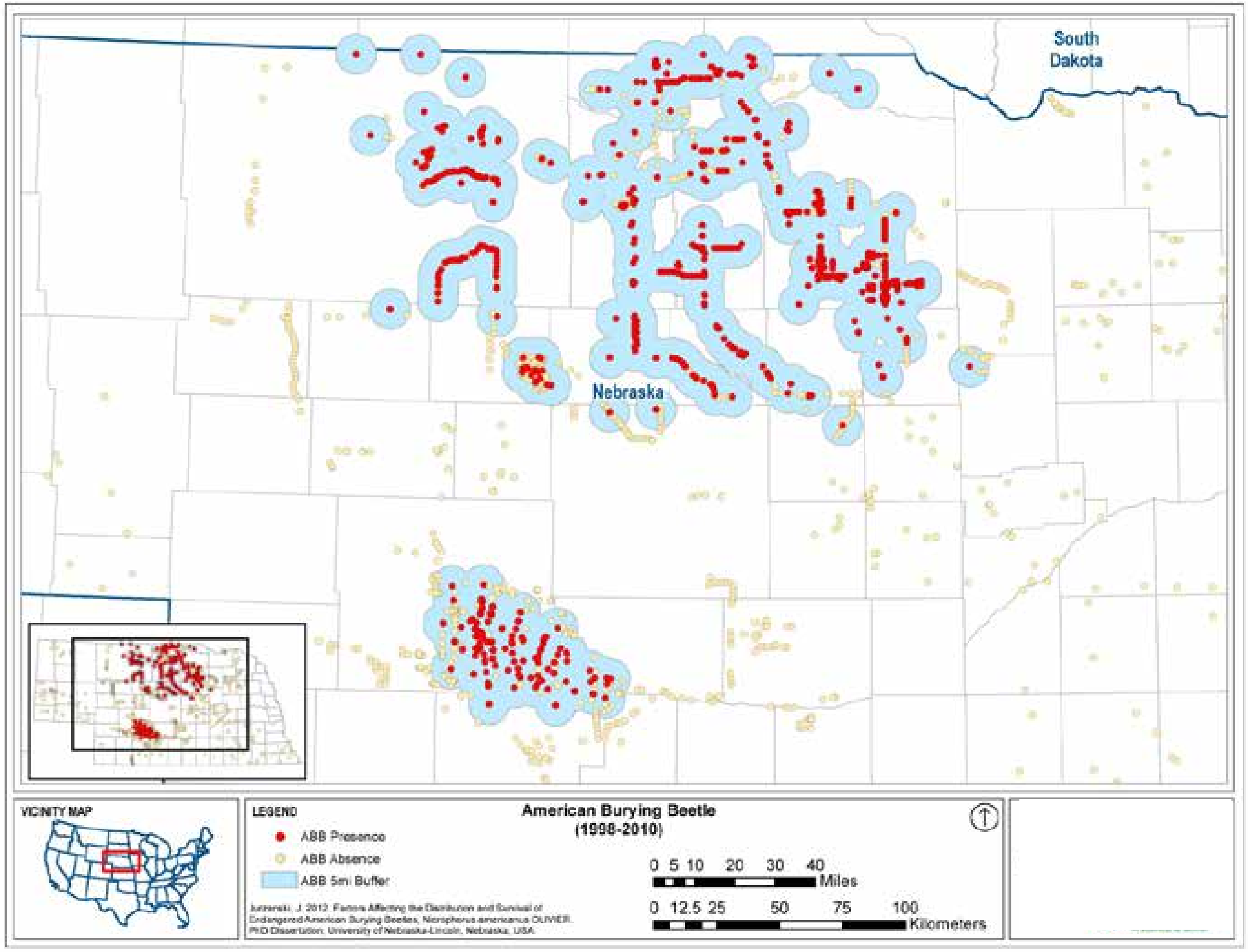


Figure 3.1.5-3 Preliminary Range of known American burying beetle presence in Nebraska (Jurzenski and Hoback 2010)

-Page Intentionally Left Blank-

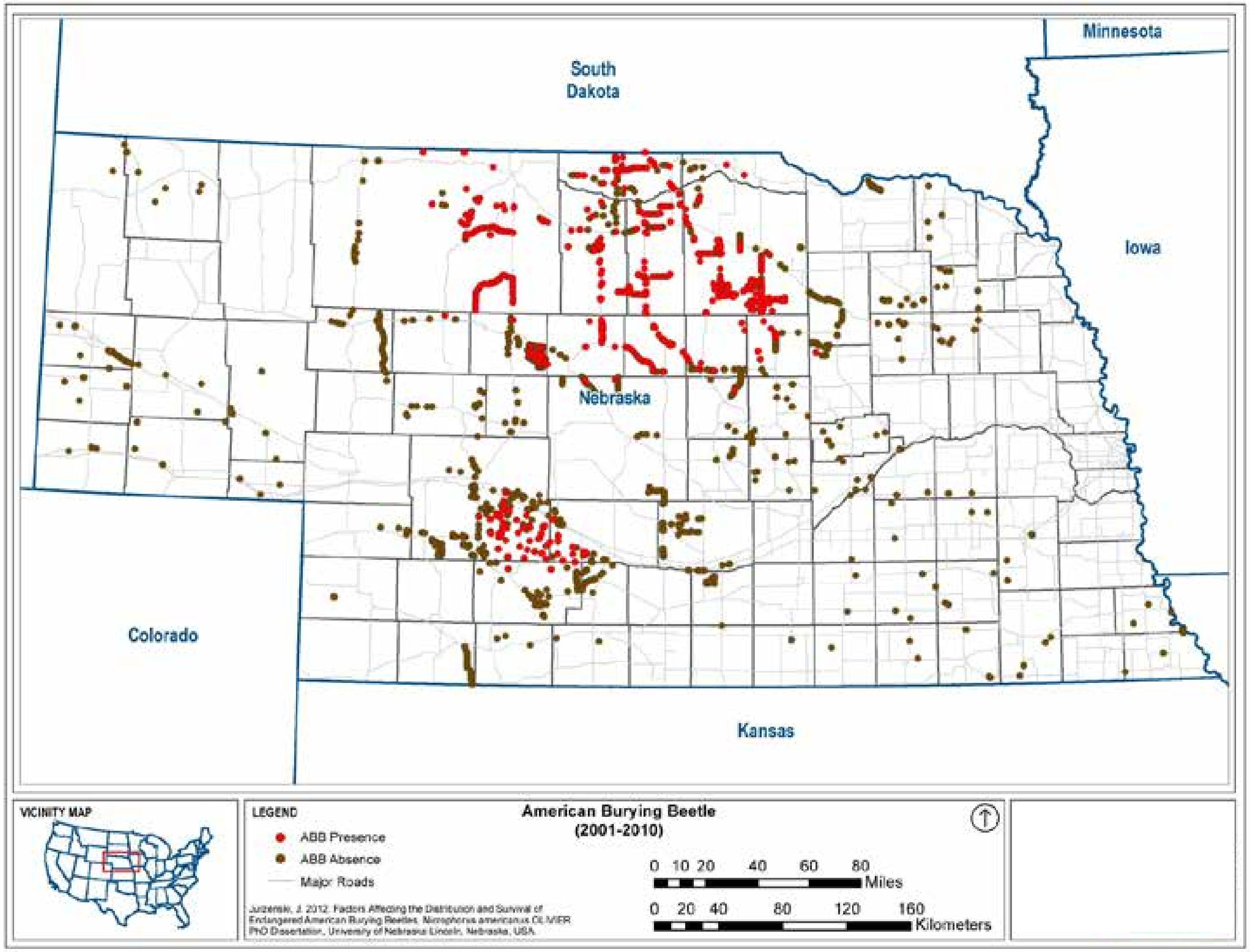


Figure 3.1.5-4 Descriptive Map of known American burying beetle presence in Nebraska (Jurzenski and Hoback 2010)

-Page Intentionally Left Blank-

Table 3.1-6 Suitability Ratings of American Burying Beetle Habitat in Route Modifications in Nebraska

County	MP	Prime	Good	Fair	Marginal	Poor	Notes
Keya Paya	601	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	602	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	603	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	604	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	605	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	606	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	607	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	608	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	609	x					Includes access road 304.
Keya Paya	610		x				At Wolf Creek. Includes access road 305. Disturbance around house
Keya Paya	611	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	612		x				Some terracing and agriculture.
Keya Paya	613		x				State Highway 12, upland.
Keya Paya	614	x					Open range.
Keya Paya	615		x				Modest agricultural disturbance.
Keya Paya	616	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Keya Paya	617				x		Includes access road 306, along row crop.
Boyd	618				x		Includes access roads 307 and 308
Boyd	619		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Boyd	620				x		Row crop agriculture or alfalfa fields in the right-of-way.
Boyd	621					x	Center pivots.
Boyd	622				x		Row crop agriculture or alfalfa fields in the right-of-way.
Boyd	623		x				Rangeland or hayfields with somewhat dry

County	MP	Prime	Good	Fair	Marginal	Poor	Notes
							conditions or absence of cottonwoods.
Boyd	624		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Boyd	625	x					Niobrara River
Holt	626	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	627	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	628	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	629	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	630	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	631		x				Hayfield with alfalfa.
Holt	632		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Holt	633					x	Center-pivot.
Holt	634					x	Center-pivot.
Holt	635	x					Includes access road 311.
Holt	636				x		Row crop agriculture or alfalfa fields in the right-of-way.
Holt	637					x	Row crop agriculture in all directions.
Holt	638				x		Row crop agriculture or alfalfa fields in the right-of-way.
Holt	639		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Holt	640	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	641		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Holt	642					x	Row crop agriculture in all directions.
Holt	643					x	Row crop agriculture in all directions.
Holt	644					x	Row crop agriculture in all directions.
Holt	645					x	Row crop agriculture in all directions.
Holt	646					x	Row crop agriculture in all directions.
Holt	647				x		Row crop agriculture or alfalfa fields in the right-of-way.
Holt	648		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.

County	MP	Prime	Good	Fair	Marginal	Poor	Notes
Holt	649	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	650				x		Row crop agriculture or alfalfa fields in the right-of-way.
Holt	651		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Holt	652	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	653	x					Wet meadow habitat used for grazing or haying. No agricultural disturbance nearby.
Holt	654		x				Pump station 22 is in marginal habitat because the range west is prime but a center-pivot is directly east.
Holt	655					x	Row crop agriculture in all directions.
Holt	656					x	Row crop agriculture in all directions.
Holt	657					x	Row crop agriculture in all directions.
Holt	658		x				Rangeland or hayfields with somewhat dry conditions or absence of cottonwoods.
Holt	659		x				Connects to 281 north of O'Neil/
Total Miles		**23**	**16**	**0**	**8**	**12**	

The proposed Project passes through three counties in Nebraska with known American burying beetle presence (Keya Paha, Boyd, and Holt counties), and one county with historic occurrence (Antelope County) (Hoback 2012). The proposed route then passes through a number of central and southern Nebraska counties where the American burying beetle has not been found historically or in the past 10 years during surveys for the species.

During the summer of 2012, American burying beetle surveys were conducted at 54 sites in northern Keya Paha, Holt, Antelope, and Boyd counties (Hoback 2012). Surveys occurred between August 2 and August 17, 2012 using standard traps baited and checked for 5 trap nights following the trapping methods advocated by the USFWS and NGPC. Traps were set on road shoulders of state and county highways within suitable habitat.

During August 2012 surveys, American burying beetles were found in Holt and Keya Paha counties. No American burying beetles were found in Boyd or Antelope counties. In Keya Paha County, American burying beetles were found at 9 locations of 14 new sites surveyed. In Holt County, American burying beetles were found at 19 new sites of 29 sites surveyed (Figure 3.1.5-5 and Figure 3.1.5-6). Capture rates ranged from 0 American burying beetles per trap night, to 2.8 American burying beetles per trap night (Hoback 2012). Because burying beetles are susceptible to desiccation (drying out) (Bedick et. al 2006), capture rates are likely to have been affected by the drought in Nebraska during summer 2012; American burying beetle abundance in these counties may have been higher under normal weather conditions.

Control traps were run during sampling at sites in Holt County, where American burying beetles were known to be numerous. These traps produced between 0.7 and 7.0 American burying beetles per trap night (Hoback 2012). The control trap success suggests that populations of American burying beetles to the east of the NDEQ-identified Sand Hills Region are not as dense as populations that occur in the Sandhills.

Based on 2012 presence/absence sampling, approximately 50 miles of the reroute in Nebraska would affect habitat occupied by low numbers of American burying beetles. The proposed Project route in Nebraska passes through approximately 50 miles of occupied habitat of which only 10 percent had captures of greater than two American burying beetles per trap night (Figure 3.1.5-6). Prior to 2010, Nebraska American burying beetle trapping protocol required three-night surveys, but in 2010 the protocol changed to five-night trapping surveys. Overall, few American burying beetles were captured in 2012 surveys compared to control sites at the same time that had much higher captures (Hoback 2012). A positive control establishes that conditions were appropriate in a given geographic area and that American burying beetles were active during the timeframe of trapping. Drought conditions causing low soil moisture may have affected the number of American burying beetles caught in 2012 surveys, but control traps did not support that conclusion. Habitat appears to be a more important indicator of abundance compared to soil moisture.

Oil transport through the pipeline creates heat that is dissipated through the soil to the ground surface. TQUEST geothermal models (TQUEST, A General Purpose, Finite-Element Program for One, Two and Three Dimensional Heat Transfer, Northern Engineering and Scientific, Appendix F, Pipeline Temperature Effects Study) was used to predict soil temperature changes at the ground surface and at various depths and distances from the center of the pipeline. Combined with general assumptions about American burying beetle life history, it is possible to estimate whether adverse impacts to the American burying beetle would likely result from the rise in soil temperatures caused by pipeline operation.

In northern areas of the American burying beetle range, in Nebraska and South Dakota, soil temperatures decline to below freezing during the winter when the beetles are underground. According to Dr. Wyatt Hoback, the beetles in northern parts of their range likely have adapted a survival strategy that requires cooling to or very near freezing to slow metabolism such that fat reserves are sufficient to last until emergence in late May or early June. Whether American burying beetles would suffer mortality from starvation if they were prohibited from freezing is not known, but substantial decreases in length of time soil temperatures are below freezing would likely cause the beetles to use too much fat energy during the winter months when they are underground. While they are underground, warming of the soil from the pipeline may also cue the American burying beetles to emerge prematurely (i.e., prior to late May or early June) when midnight air temperatures typically reach about 60°F. This may result in American burying beetles above ground without the ability to feed appropriately, or to use more energy resources to rebury themselves in the soil, assuming temperatures permit such activity.

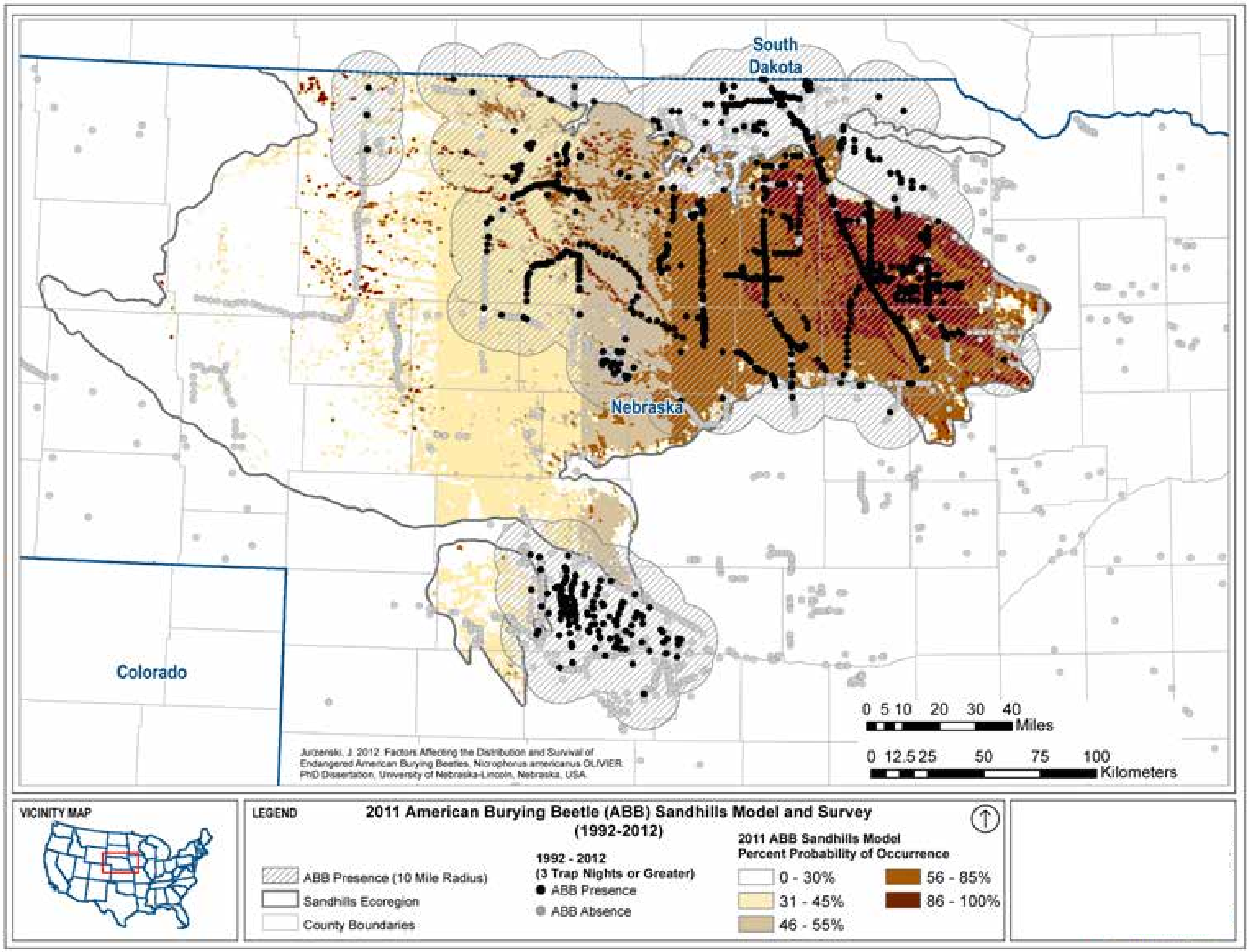


Figure 3.1.5-5 Results of 2012 sampling in relation to proposed reroute.

Note: American burying beetles were found in Keya Paha and northern Holt Counties but were not found east of Highway 183.

-Page Intentionally Left Blank-

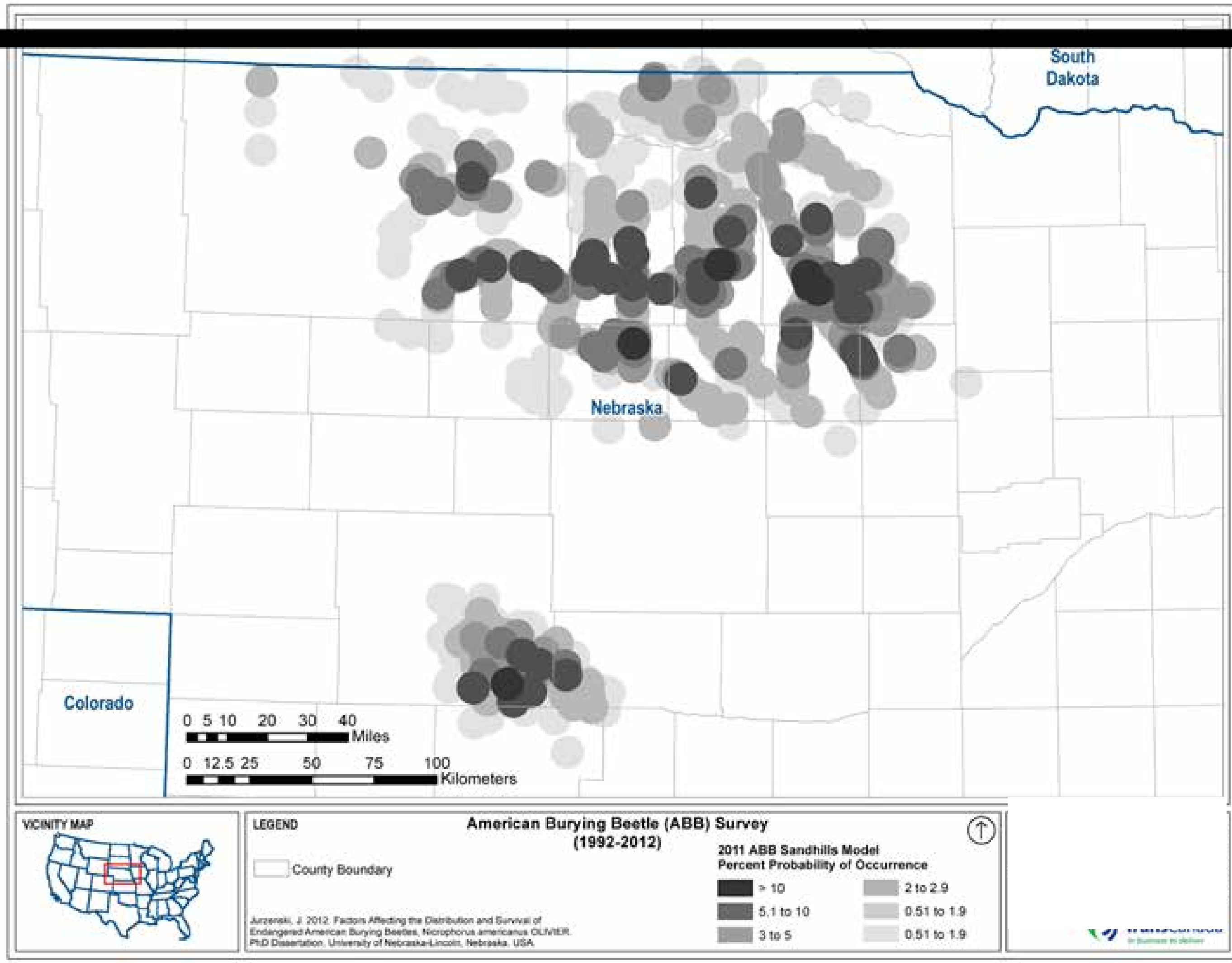


Figure 3.1.5-6 Trap data 1999-2012 where American burying beetle per trap night for three trap nights[1] are plotted (with a five mile buffer) as an estimate of American burying beetle density.

Prior to 2010, trapping protocol required trapping for three-trap nights, which changed to five-trap nights in 2010.

-Page Intentionally Left Blank-

A complicating factor in evaluating thermal impacts to overwintering American burying beetles is that the impacts vary with depth in the soil, and there are disparities in available information regarding the depth at which American burying beetles overwinter in the soil. Although Schnell et al. (2008) noted in field experiments in Arkansas that American burying beetles overwintered at an average depth of 6 cm (2.4 inches) with some as deep as 20 cm (8 inches), most information refers to depth of carcass burial associated with reproduction. These reproductive chamber depths are described as "several inches" by Ratcliffe (1996, p. 46), or up to 60 cm underground (approximately 24 inches) (Wilson and Fudge 1984, Pukowski 1933, and Hinton 1981; as cited in Scott 1998).

The American burying beetle is the largest carrion beetle in North America (Ratcliffe 1996), and Eggert and Sakaluk (2000) found that larger beetles buried carcasses deeper in the soil. For the Pipeline Temperature Effects Study (Appendix F), potential temperature changes (compared to background) were analyzed at depths of 6 inches, 12 inches, and 24 inches. Additionally, potential temperature changes were analyzed at various distances from the pipeline center line and within two soil types at different water saturations (Table 3.1-6). The analysis was completed using a pipeline heat dissipation model to predict underground temperature changes resulting from operation of the proposed pipeline (Appendix F, Pipeline Temperature Effects Study). The temperature model predicts that background temperatures (i.e., temperatures 80 feet from the pipeline center line) would remain frozen during the winter at a depth of 24 inches within all but the driest of the two types of soils SH1 and SH4 (Table 3.1-6). In the three sandy soils prevalent in the Sandhills (i.e., SH4, SH5, and SH6), background temperatures at 12 inches depth equaled or fell below 32°F during seven or eight, 2-week time periods during the winter. However, at 11 feet from the pipeline centerline (22-foot wide sub-corridor), soil remained frozen during four and six 2-week time periods (i.e., in SH5 and SH6), and did not freeze during the winter in SH4 soils (Table 3.1-6).

Table 3.1-6 Incidence of Modeled Soil Temperatures at Freezing or Below with Varying Distance from the Pipeline Centerline at Varying Depths[a]

	Silty Loam Soil			Sandy Soil		
Distance from Center Line	**SH1 5% Moisture Content**	**SH2 18% Moisture Content**	**SH3 37% Moisture Content**	**SH4 5% Moisture Content**	**SH5 14% Moisture Content**	**SH6 28% Moisture Content**
80 ft (back ground)	**8-9**-6-0[b]	8-8-**7-3**	9-**8-8-2**	8-**8-7**-0	8-**8-7-4**	9-**8-8-5**
11 ft.	8-**7-0**-0	8-8-**5-0**	9-**7-6-0**	8-**5-0**-0	8-**7-4-0**	9-**7-6-0**
7 ft.	8-5-0-0	8-6-0-0	7-6-0-0	7-3-0-0	7-5-0-0	7-6-0-0
3 ft.	8-2-0-0	6-0-0-0	5-0-0-0	6-0-0-0	4-0-0-0	4-0-0-0

a Freezing or below considered ≤ 32 °F

b Incidence of temperatures ≤ 32 ºF. are described in a W-X-Y-Z format, where:
W is the incidence of freezing at the ground surface,
X is the incidence of freezing at a depth of 6 inches,
Y is the incidence of freezing at 12 inches, and
Z is the incidence at 24 inches deep.

Temperature output is modeled at 2-week intervals. Differences in incidence of frozen soil between background (80 feet) and at 11 feet from the center of the pipeline (i.e., a 22-foot sub-corridor) are shown in red.

Modeling predicted a reduction in the incidence of frozen soils from 25 percent (twice) to 100 percent (twice) at a depth of 12 inches and 11 feet from the pipeline centerline. The estimated total duration of unfrozen soils would likely be sufficient to adversely affect American burying beetles overwintering within 11 feet from the pipeline centerline, based on the 2-week time period summaries (Appendix F, Pipeline Temperature Effects Study). Uncertainties and assumptions are associated with both the heat dissipation model and the biological requirements of the American burying beetle. However, temperature shifts above background levels substantial enough to influence habitat out to 11 feet from the pipeline (i.e., a 22-foot sub-corridor) were determined to make habitat unsuitable for American burying beetle overwintering. Some level of thermal effects may extend beyond the 22-foot sub-corridor. However, distinct and measureable differences that are likely biologically significant for American burying beetles can be identified out to 11 feet from the pipeline centerline based on the available model (Appendix F, Pipeline Temperature Effects Study).

3.1.5.3 Impact Evaluation

Construction

Direct impacts to American burying beetles as a result of construction during vegetation clearing, site grading, and trench excavation would result in temporary habitat loss, potential alteration of suitable habitat to unsuitable habitat, temporary habitat fragmentation where the pipeline is not already co-located with other utilities, and potential mortality to eggs, larvae, and adults through construction vehicle traffic and exposure during excavation. Artificial lighting has the potential to disrupt foraging and increase predation on the American burying beetle. Most construction would take place during daylight hours and construction areas would not generally use artificial lighting.

Activities that could potentially require lighting could include critical pipeline tie-ins, HDD crossings, and certain work required after sunset due to weather, safety, or other proposed Project requirements. HDD crossings would require 24-hour operation until the crossing is completed. Localized fuel spills may occur during construction. However, Keystone would develop and implement a Spill Prevention Control and Countermeasures Plan (Appendix D, SPCC Plan and ERP) for potential construction-related fuel spills which would mitigate and avoid any short-term impacts.

Burying beetles, including the American burying beetle, are sensitive to soil moisture and die quickly when desiccated (Bedick et al. 2006). Under laboratory conditions, American burying beetles seek soils containing high moisture levels during periods when they are inactive. During construction, soil moisture may be reduced across the ROW as the site is prepared by removing vegetation and topsoil and grading. Equipment operations within the ROW would compact the substrate. During restoration, sub-soil and soil would be de-compacted and vegetation cover would be re-established within both the temporary and permanent ROW. Native vegetation seed would generally be used, unless otherwise directed by the landowner. As stated in the Project CMRP (Appendix B), the objectives of restoration and revegetation are to return the disturbed areas to approximate pre-construction vegetation, use, and capability. This involves treatment of soil as necessary to preserve approximate pre-construction capability and stability in a manner consistent with the original vegetation cover and land use. Compaction resulting from construction would typically be relieved as follows:

- Compacted cropland would be ripped a minimum of three passes at least 18 inches deep and all pasture would be ripped or chiseled a minimum of three passes at least 12 inches deep before replacing topsoil.
- Areas of the construction ROW that were stripped for topsoil salvage would be ripped a minimum of three passes (in cross patterns, as practical) prior to topsoil replacement. The approximate depth of ripping would be 18 inches (or a lesser depth if damage may occur to existing drain tile systems). After ripping, the subsoil surface would be graded smooth and any subsoil clumps broken up (disk and harrow) in an effort to avoid topsoil mixing.
- The Contractor would test the decompacted construction ROW at regular intervals for compaction in agricultural and residential areas. Tests would be conducted on the same soil type under similar moisture conditions in undisturbed areas immediately adjacent to the ROW to approximate pre-construction conditions. Penetrometers or other appropriate devices would be used to conduct tests.
- Topsoil would be replaced to pre-existing depths once ripping and disking of subsoil is complete up to a maximum of 12 inches. The contractor would alleviate topsoil compaction on cultivated fields with cultivation methods.
- If there is any dispute between the landowner and Keystone as to what areas need to be ripped or chiseled, the depth at which compacted areas should be ripped or chiseled, or the necessity or rates of lime and fertilizer application, the appropriate NRCS office would be consulted by Keystone and the landowner.

In the first year after construction, Keystone would inspect the ROW to identify areas of erosion or settling. Subsequently, Keystone would monitor erosion and settling through aerial patrols, which are part of Keystone's Integrity Management Plan, and through landowner reporting. Keystone is required to monitor the pipeline no more frequently than every 3 weeks once operations begin. This would mostly be done from aerial reconnaissance, but also ground inspections. In addition, landowners are asked to report on areas where seeds have not germinated or where erosion has occurred. Keystone then dispatches crews to repair and address the issues that are found (see also Appendix B, CMRP, Section 4.16).

The final seed mix for revegetating the ROW would be based on input from the NRCS, appropriate state wildlife resource agencies (in South Dakota and Nebraska), and the availability of seed at the time of restoration. However, the landowner may request specific seeding requirements during easement negotiations that may not include seeds from native plant communities or be consistent with previous land use. Keystone would be required to comply with these specific requests and would be unable to require the landowner to re-establish native plant communities on private lands. The following provisions from the Project CMRP apply to ROW revegetation:

- Certificates of seed analysis are required for all seed mixes to limit the introduction of noxious weeds.
- Seed not utilized within 12 months of seed testing must be approved by Keystone prior to use. Seeding must follow cleanup and topsoil replacement as closely as possible. Seed must be applied to all disturbed surfaces (except cultivated fields unless requested by the landowner) as indicated on the construction drawings.

- Weather conditions, construction ROW constraints, site access, topography, and soil type will influence the seeding method to be used (i.e., drill seeding versus broadcast seeding).
- The contractor would plant seed at depths consistent with the local or regional agricultural practices.
- Hydro seeding may be used, on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods.
- Keystone would work with landowners to discourage intense livestock grazing of the construction ROW during the first growing season by using temporary fencing or deferred grazing, or increased grazing rotation frequency.

In wetlands, the contractor would replace topsoil and restore original contours with no crown over the trench, as much as practicable. Any excess soil would be removed from the wetland. The contractor would stabilize wetland edges and adjacent upland areas by establishing permanent erosion control measures and revegetation, as applicable, during final cleanup.

It is anticipated that the construction methods of replacing topsoil and re-establishing appropriate, non-sod-forming vegetation would result in re-establishing natural soil hydrology within the construction ROW and would result in no long-term impacts to American burying beetle habitat.

USFWS recommends continued consultation consistent with Section 7 of the ESA to develop avoidance, minimization, and mitigation strategies for this species. Such strategies will likely include carrion removal, mowing, and windrowing, downshielding of light sources, use of sodium vapor lights, capture relocation procedures, and habitat mitigation. However, mowing, windrowing, and capture relocation techniques are not approved avoidance and minimization techniques in South Dakota.

In addition to the conservation measures outlined above, the Pierre, South Dakota USFWS Ecological Services Field Office has recommended the following additional measures to protect the American burying beetle:

- Construction camp near Winner, South Dakota, should be built on cropland very close to Winner, and/or north of Highway 18 in Tripp County.
- Two pipe stockpile sites planned for Tripp County should be placed on cropland, or north of Highway 18.
- Gregory County, South Dakota, contractor yard should be built on cropland, or north of Highway 18.
- Because the American burying beetle is attracted to light at night, working at night with lights in southern Tripp County should be avoided. If working at night cannot be avoided, lighting should only be used between September 1 and June 1.

Operation

The activity period for the American burying beetle across its range is usually late April through September (USFWS 1991). Active periods are associated with night air temperatures, with peak activity occurring when night temperatures are 60°F or greater at midnight. Upon emergence from overwintering, American burying beetles seek a suitable carcass upon which to reproduce. They spend approximately six weeks underground attending the carcass followed by emergence of the new brood in early August.

These individuals seek a carrion resource upon which they feed and then they find an area in which to overwinter, presumably digging beneath the ground in an area that cools to low temperature (to depress metabolic rate) but does not freeze solid (assuming that the beetles do not possess mechanisms to survive freezing). Schnell et al. (2008) found that in Arkansas, surviving American burying beetles overwintered at an average depth of 6 cm (2.4 inches) with some as deep as 20 cm (8 inches). Additionally, reproductive chamber depths are described as “several inches” by Ratcliffe (1996, p. 46), or up to 60 cm underground (approximately 24 inches) (Wilson and Fudge 1984, Pukowski 1933, and Hinton 1981; as cited in Scott 1998).

The American burying beetle is the largest carrion beetle in North America (Ratcliffe 1996), and Eggert and Sakaluk (2000) found that larger beetles buried carcasses deeper in the soil. During daily periods of inactivity, American burying beetles and *Nicrophorus orbicollis*, a closely related, nocturnal species bury to approximately 24 cm (10 inches).

TQUEST geothermal models (Appendix F, Pipeline Temperature Effects Study) of pipeline effects to surrounding soils, calculated at ultimate capacity operating flow rates for the proposed Project (830,000 bpd), indicate the potential for the pipeline to warm surface areas by as much as 10°F in northern regions (South Dakota and Nebraska) (See Appendix F, Pipeline Temperature Effects Study). The actual overwintering behavior and location for American burying beetles is currently unknown but several studies have concluded that overwintering results in approximately 30 percent mortality (Schnell et al. 2008).

Factors that affect soil temperature could increase the overwintering mortality by 1) triggering early emergence when prey is not available and when cold temperatures could result in adult mortality; 2) causing higher metabolism for these insects resulting in starvation prior to emergence; or 3) causing mortality from the beetles losing too much water because warmer temperatures result in greater desiccation risk to burying beetles (Bedick et al. 1999). Therefore routine operation of the proposed Project potentially affects American burying beetles and their habitat. Modeled heat dissipation from the pipeline indicates potential seasonal thermal effects on soil freezing to an area within about 11 feet around the pipe compared to background temperatures (See Appendix F, Pipeline Temperature Effects Study).

Adverse effects to American burying beetle resulting from a crude oil spill from the pipeline are highly improbable due to the low probability of a spill, low probability of a spill coinciding with the presence of American burying beetles, and low probability of an American burying beetle contacting the spilled product (See Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis).

Lights associated with aboveground facilities, particularly if the lights emit wave lengths in the UV spectrum, may attract American burying beetles, as they are known to be positively phototrophic. However, only one sodium vapor light with downshield attached above each pump station door would be used. Pump stations within American burying beetle habitat represent permanent habitat loss.

Power Lines and Substations

Some power distribution lines to pump stations coincide with areas of potentially suitable habitat or occupied habitat, including:

- Tripp County, South Dakota – Pump Station 21 – good habitat.
- Holt County, Nebraska – Pump Station 22 – low quality habitat.

Construction and maintenance of power lines to these pump stations could affect the American burying beetle. Keystone has informed power providers of the requirement to consult with USFWS concerning the construction and operation of the power distribution lines. No other actions connected to the proposed Project would coincide with the currently occupied range of the American burying beetle.

Cumulative Impacts

Other past, present, and foreseeable future projects in South Dakota (as indicated on Figure 2.2.3-1) are relatively sparse with significant geographic separation. The American burying beetle does not occur in Montana, therefore the connected action Bakken Marketlink Project would have no impact on the American burying beetle. In South Dakota the Big Bend to Witten 230-kV Transmission Line in Tripp County, would be north of Highway 18 and outside of the suitable habitat for American burying beetles. However, American burying beetle locations in Nebraska occur within the proposed Project and several other projects in proximity to these locations. Furthermore, there are potential impacts to the American burying beetle associated with the concurrent construction of the TransCanada Gulf Coast pipeline project. Construction of new pipelines or other ground disturbing projects through southern South Dakota and north-central Nebraska could contribute to cumulative mortality and loss of habitat. Any additional potential losses within this species would likely require conservation measures, thus reducing overall cumulative impacts on the American burying beetle.

The American burying beetle could likely experience some direct mortality during construction with reduced habitat causing long-term impacts and a delay in population recovery. To minimize this impact several avoidance and conservation measures would be implemented. Any future projects in the area that reduce and fragment preferred habitat for the burying beetle may provide the potential for additive cumulative effects to this species. Any additional potential losses would likely require similar conservation measures and mitigations, thus reducing overall cumulative impacts on the American burying beetle.

3.1.5.4 Conservation Measures

The following conservation measures have been discussed and would be implemented to avoid, minimize, and compensate for impacts to the American burying beetle:

- Prior to construction disturbance and grading for the ROW, trapping and relocating American burying beetles would be implemented only in Nebraska where access is available to remove adult beetles from the construction ROW in accordance with the Nebraska American Burying Beetle Trapping Protocol (USFWS and NGPC 2008;). Trapping and relocating American burying beetles is not authorized in South Dakota.

- Mowing and windrowing vegetation would be conducted during the trap and relocate period to temporarily reduce habitat suitability by drying out the soil surface. Mowing would be done so that vegetation is at most 8 inches in height. Windrowing would be done to remove vegetation residue. Mowing and windrowing would be implemented only in Nebraska. Mowing and windrowing cannot be used in South Dakota as an avoidance and minimization measure.
- After the trap and relocate efforts are completed, the ROW would be disturbed (graded) prior to the next June American burying beetle active period in Nebraska (e.g., trap and relocate efforts take place during the August active period, and the ROW disturbance would take place prior to the following June active period).
- In areas where the ROW could not be disturbed (graded) before the next active period, trap and relocate efforts would be repeated in Nebraska (e.g., trap and relocate efforts would be repeated during the June active period, and the ROW would be disturbed in August before the following active period).
- After trap and relocate efforts are completed in Nebraska, a biologist would travel the ROW every couple of days during the American burying beetle active period (June through September) to remove any carcasses that may be present within the ROW.
- During construction in the American burying beetle range in Nebraska, a biologist would travel the ROW every couple of days during the American burying beetle active period (June through September) to remove any carcasses that may be present within the ROW.
- Keystone would train all workers operating in American burying beetle habitat and would include discussion of American burying beetle habitat, biology, reasons for their decline, and responsibilities of all workers for the protection of the American burying beetle (including removing food wastes from the ROW each day, reporting any American burying beetle sightings to an environmental inspector, and avoiding bringing dogs and cats to the ROW). Keystone will produce a full color Endangered Species Card with a picture of the American burying beetle and all of this information summarized on the card. The card will be handed out to all construction workers operating in American burying beetle habitat.
- Signs would be posted at all access points to the ROW highlighting the areas as American burying beetle habitat and reminding workers to follow special restrictions in the area.
- Keystone would down-shield lighting and install sodium vapor-type lights at ancillary facilities within areas occupied by the American burying beetle to avoid attracting American burying beetles to the construction or operation site.
- Keystone would provide compensation for temporary construction and permanent operations impacts to the American burying beetle as part of a habitat conservation Trust in areas where American burying beetles are likely to be impacted including: southwest of Highway 18 in Tripp County, South Dakota; Keya Paha, and Holt counties in Nebraska. Compensation would be based on total acres impacted where American burying beetle presence was confirmed. Compensation would be based on a total acres impacted and would be modified by habitat quality rating multipliers with prime habitat compensation at 3 times the total impact acres; good habitat at 2 times the total impact acres; fair habitat at 1 times the total impact acres; and

marginal habitat at 0.5 times the total impact acres. No compensation would be provided for poor habitat. In Nebraska only, no compensation would be provided for habitat where no American burying beetles have been found. In South Dakota, compensation would be provided based on only habitat quality rating multipliers and not American burying beetle survey information. No American burying beetle surveys will be done in South Dakota. Temporary habitat impacts would be scaled for the period of time anticipated for recovery of vegetation cover at 4 years over the 50-year life of the proposed Project or 8 percent of total calculated impacts. All compensation would be based on habitat ratings and compliant with agreements between the Department, USFWS, and Keystone.

- Keystone would provide funding for compliance monitoring. The Department would designate USFWS or an agreed-upon third-party, such as a nongovernmental organization, that would work with USFWS to ensure that vegetation restoration efforts were successful for American burying beetle habitat, as discussed during consultation between the Department, USFWS, and Keystone.
- Keystone may set aside funds for a restoration performance bond. The bond would be applied to supplemental vegetation restoration that could be necessary if restoration for American burying beetle habitat failed, as discussed during consultation between the Department, USFWS, and Keystone.

With respect to these conservation measures, it is noted that the NGPC and USFWS recommend trapping and relocating American burying beetles only in Nebraska prior to construction, as an avoidance procedure designed to reduce the total number of beetles possibly taken by the proposed Project construction. Trapping and relocating would result in take of American burying beetles through handling and release, away from the proposed project site. Such take may be authorized only in a USFWS Biological Opinion incidental take statement.

Conversely, the Pierre, South Dakota USFWS Ecological Services Field Office and SDGFP do not recommend trapping and relocating American burying beetles in South Dakota. According to the South Dakota USFWS Ecological Services Field Office, recommended conservation measures for American burying beetles to offset Project impacts include providing compensation to be used for American burying beetle conservation in states affected by the proposed Project.

3.1.5.5 Determination

Effect on Critical Habitat

Critical habitat has not been designated for the American burying beetle. Therefore, the proposed Project would not result in the destruction or adverse modification of federally designated critical habitat for the American burying beetle.

Effect on the Species

The proposed Project “may affect, and is likely to adversely affect” the American burying beetle. This determination is based on the location of the proposed Project within the known range and habitat of the American burying beetle and the results from surveys along the proposed Project route. Further, this determination is balanced by Keystone’s commitment to mow and windrow suitable habitat for the species and collect carrion along the proposed Project construction site in Nebraska. Implementation of trap and relocation efforts in Nebraska and project construction and operation in South Dakota without trap and relocation efforts, mowing, and windrowing could result in the incidental take of American burying beetles during construction or operation of the proposed pipeline. The USFWS will estimate incidental take and will issue an incidental take statement for the proposed Project. Keystone will implement conservation measures including providing compensation for impacts to the American burying beetle based on the total acres of occupied habitats that would be altered. Monetary compensation will be applied to conservation efforts for the species.

3.2 FEDERALLY THREATENED

3.2.1 Piping Plover - Threatened

3.2.1.1 Natural History and Habitat Association

The piping plover (*Chardrius melodus*) was listed as endangered and threatened December 11, 1985 (50 FR 50726). Piping plover on the Great Lakes were listed as endangered, while the remaining Atlantic and Northern Great Plains populations were listed as threatened. Migrating and wintering populations of piping plover also were classified as threatened. Populations of piping plover within the proposed Project area are considered to belong to the threatened Northern Great Plains population. The USFWS designated critical habitat for the Northern Great Plains breeding population of the piping plover (67 FR 57638) in Montana, Nebraska, North Dakota, and South Dakota in 2002 (USFWS 2002), but the Nebraska critical habitat was later remanded (67 FR 57638) (USFWS 2009). The proposed Project does not cross designated critical habitat.

Historically, piping plover bred across three geographic regions: United States and Canadian Northern Great Plains from Alberta to Manitoba south to Nebraska, Great Lakes beaches, and Atlantic coastal beaches from Newfoundland to North Carolina. Wintering areas are not well known, although wintering birds have been most often seen along the Gulf of Mexico, southern United States Atlantic coastal beaches from North Carolina to Florida, eastern Mexico, and scattered Caribbean Islands (Haig 1986; USFWS 1988b). The piping plover’s current breeding range is similar except that breeding populations in the Great Lakes have almost disappeared (Haig and Plissner 1993).

Piping plover begin arriving on breeding grounds in mid-April and most birds have arrived in the Northern Great Plains and initiate breeding behavior by mid-May (USFWS 1994). Populations that nest on the Missouri, Platte, Niobrara, and other rivers use beaches and dry barren sandbars in wide, open channel beds (USFWS 2012b). Nesting season for the piping plover is from April 15 through September 1. Nesting habitat of inland populations consists of sparsely vegetated shorelines around small alkali lakes, large reservoir beaches, river islands and adjacent sandpits, and shorelines associated with industrial ponds (Haig and Plissner 1993). Vegetation cover is usually 25 percent or less (USFWS 1994). Piping plovers feed by probing the sand and mud for insects, small crustaceans, and other invertebrates in or near shallow water. When feeding, this species alternates between running and pausing to search for prey (Bent 1929).

Nests consist of shallow scrapes in the sand with the nest cup often lined with small pebbles or shell fragments. The nest is typically far from cover. Nesting piping plover have been found in least tern nesting colonies at a number of sites on Great Plains river sandbars and sand pits (USFWS 1994). Egg laying commences by the second or third week in May. The female generally chooses from several nest sites the male has constructed. Complete clutches contain three to four cryptically colored eggs (USFWS 1994). Incubation is shared by the male and female and averages 26 days. Incubation begins only after the last egg is laid and eggs typically hatch on the same day. Brooding duties also are shared by the male and female. Broods remain in nesting territories until they mature unless they are disturbed. Fledging takes approximately 21 to 35 days (USFWS 1994). If a nest fails or is destroyed, adults may re-nest up to four times (USFWS 1987). Breeding adults begin leaving nesting grounds as early as mid-July with the majority gone by the end of August (Wiens 1986, as cited in USFWS 1994).

Threats to piping plover nesting habitat include reservoirs, channelization of rivers, and modifications of river flows that have eliminated hundreds of kilometers of nesting habitat along Northern Great Plains' rivers (USFWS 1994). Eggs and young are vulnerable to predation and human disturbance, including recreational activities and off-road vehicle use. Human-caused disturbance to wintering habitats is also a threat to the continued existence of this species. Motorized and pedestrian recreational activities, shoreline stabilization projects, navigation projects, and development can degrade and eliminate suitable wintering habitat for this species.

3.2.1.2 Potential Presence in Project Area

Keystone XL Pipeline Project

Presence of breeding piping plovers along the proposed Project is restricted to Montana and Nebraska. During a meeting with Keystone representatives on June 10, 2008, SDGFP stated that breeding piping plovers are not located within the proposed Project area. Potential nesting habitat within the proposed Project area for the piping plover is restricted to sandy beaches and sandbars along the Platte, Loup, and Niobrara rivers in Nebraska and alkali wetlands and the Fort Peck Reservoir in Montana (Atkinson and Dood 2006, 67 FR 57638). According to the USFWS Billings Ecological Services Field Office in Montana, individual transient piping plovers may be observed along the Yellowstone River but there are no nesting records within the Project area (AECOM 2009g).

Montana

Birds breeding in Montana are found nesting in the Fort Peck Reservoir. Wetland and waterbody surveys conducted between May and November 2008 to 2011 did not identify any suitable wetlands for nesting piping plovers along the entire route in Valley County. Additional consultation with the USFWS Billing Ecological Services Field Office (AECOM 2009g) indicates that historic surveys have failed to identify nesting piping plover within the proposed Project area. Therefore, surveys are not recommended for the piping plover in Montana.

Nebraska

Birds breeding in Nebraska are found nesting on sandbars and at commercial sand pits and forage in wet sand on sandbars and mud flats in rivers and associated wetlands along three rivers crossed by the proposed Project: Niobrara, Loup, and Platte rivers. Piping plovers migrate through Nebraska during both the spring and fall. These crossings were historically identified as critical habitat for the piping plover. Personal communication with the USFWS Grand Island, Nebraska Field Office in 2008 and 2009 indicated that designated critical habitat has been vacated in Nebraska and is no longer legally recognized as such (USFWS 2008c).

Crossings of the Missouri, Platte, Loup, and Niobrara rivers were surveyed by Keystone in July 2008, June 2011, and June and July 2012 to confirm presence or absence of suitable breeding habitat and breeding piping plovers (2008, 2011, and 2012 surveys for this species are provided in Appendices H, I, and J). One individual foraging plover was identified at the Niobrara River crossing in 2008. No nesting piping plovers were identified within line-of-sight of the ROW crossing of the Missouri, Platte or Loup rivers. Table 3.2-1 summarizes the piping plover survey results from 2008 to 2012. In the winter of 2011, the Missouri River flooded, and suitable piping plover habitat may have also flooded and thus may not have been present that year. Surveys would be repeated at these locations prior to construction, to ensure that no nests have been built within 0.25 mile of the ROW or any areas affected by construction activities.

Table 3.2-1 Occurrence Surveys for the Piping Plover along the Proposed Project Right of Way in 2008, 2011, and 2012[a]

State	County	Survey Location	Survey Corridor	Survey Date	Survey Results	Comments
Montana	Valley/ McCone	Missouri River	0.25-mile each side of centerline crossing	June 3 and July 11, 2011	No piping plover observed.	Poor bank and no island nesting habitat, suitable foraging habitat.
Nebraska	Keya Paha/ Rock	Niobrara River	0.25-mile each side of centerline	July 22, 2008, July 7 2011, June 22 - 26, 2012	One piping plover observed in 2008.	Good bank and island nesting habitat, suitable foraging habitat at crossing location.
Nebraska	Nance	Loup River	0.25-mile each side of centerline	July 21, 2008, July 6 & 7, 2011, June 14 - 18 2012	No piping plover observed.	Suitable nesting and foraging habitat at crossing location.
Nebraska	Merrick/ Hamilton	Platte River	0.25-mile each side of centerline	July 22, 2008, July 6 & 7, 2011, July 15 - 20 2012	No piping plover observed.	Good nesting and foraging habitat at crossing location, however very little water present in 2012 due to drought

[a] Survey reports: Appendices H, I, and J.

3.2.1.3 Impact Evaluation

Construction

The primary construction-related impacts would be disturbance and potential exposure to small fuel spills and leaks from construction machinery. The chance of construction-related spills during construction within piping plover habitat is minimal. According to Keystone's CMRP (Appendix B), "The contractor shall not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating within 100 feet of any waterbody. The contractor shall not refuel construction equipment within 100 feet of any waterbody. If the contractor must refuel construction equipment within 100 feet of a waterbody, it must be done in accordance with the requirements outlined in the CMRP Section 3, Spill Prevention and Containment (Appendix B). All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. All equipment parked overnight shall be at least 100 feet from a watercourse or wetland, if possible. Equipment shall not be washed in streams or wetlands."

All river crossings that provide suitable nesting habitat for the piping plover (Niobrara, Loup, and Platte) would be crossed using HDD. There is a potential for HDD frac-outs (accidental releases of pressurized drilling mud from the borehole) to occur during construction. A frac-out could release bentonitic drilling mud into the aquatic environment. Bentonite is non-toxic; the released drilling mud would disperse in flowing water or eventually settle in standing water.

The proposed minimum depth for HDD pipeline sections is 25 feet below the streambed. In some instances, the pressurized fluids and drilling lubricants used in the HDD process may escape the active bore, migrate through the soils, and come to the surface at or near the construction site, an event commonly known as a frac-out. Most leaks of HDD drilling fluids occur near the entry and exit locations for the drill and are quickly contained and cleaned up.

Frac-outs that may release drilling fluids into aquatic environments are difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. While the HDD method poses a small risk of frac-out, potential releases would be contained by best management practices that are described within the HDD contingency plans required for drilled crossings and prepared by the pipeline contractor prior to construction. These practices include monitoring the directional drill, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.

Keystone XL Pipeline Project

As indicated, the piping plover is known to nest within or near the proposed Project at the Platte, Loup, and Niobrara rivers in Nebraska and Valley County in the Fort Peck Reservoir in Montana. No direct impacts to the piping plover or its breeding habitat would be anticipated at the Platte, Loup, and Niobrara rivers since pipeline placement across the rivers would be completed using the HDD method. Additionally, based on consultation with the USFWS, no impacts are anticipated along the proposed Project route in Montana (AECOM 2009g).

Indirect impacts could result from increased noise and human presence at work site locations if nesting plover are located within 0.25 mile of the proposed Project. Prior to construction-related activities, including HDD and hydrostatic testing that would occur within 0.25 mile from potential breeding habitat, Keystone proposes to conduct presence/absence surveys up to 2 weeks prior to construction-related activities to identify active nest sites, in coordination with the USFWS. If occupied breeding territories and/or active nest sites are identified, the USFWS would be notified and appropriate protection measures would be implemented on a site-specific basis in coordination with the USFWS. Use of down-shielding on lights would be used should night HDD work be planned during nesting season where an active colony is located within 0.25-miles from the proposed HDD site and vegetative screen is lacking.

Impacts to piping plovers from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided based on Keystone's plan to withdraw the volume of water needed at a rate less than 10 percent of the baseline daily flow and to return water back to its source within a 30-day period.

Operations

There are no known occurrences of piping plovers nesting within the proposed Project area; therefore, indirect impacts during aerial and ground surveillance are unlikely to disturb nesting plovers. However, aerial surveillance is conducted 26 times per year at intervals no greater than 3 weeks; the aircraft passes by an area quickly at an altitude of about 1,000 feet during those aerial patrols.

A spill resulting from a leak in the proposed pipeline is unlikely to affect the piping plover. The major rivers that contain suitable breeding habitat in Nebraska would be crossed by HDD. In the unlikely event of a leak, the crude oil would need to penetrate a significant amount of overburden before reaching the river, thereby reducing the risk in some cases of crude oil reaching the river and thereby reducing the potential for piping plover exposure. Additionally, some of the major rivers crossed by the proposed Project which provide nesting or migration habitat for the piping plover are within or in close proximity to USDOT-designated High Consequence Areas and are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195). Further, if a significant spill event were to occur, federal and state laws would require clean up.

Direct contact with a crude oil spill could result in adverse effects to piping plovers due to plumage oiling, crude oil ingestion from contaminated plumage and prey, and crude oil transfer to eggs and young. While these exposure routes have the potential to cause adverse effects to individuals, the probability of adverse effects to piping plovers are unlikely due to the low probability of a spill, low probability of the spill coinciding with the presence of piping plover individuals, and low probability of the spill reaching a major river in sufficient amounts to cause toxic effects. The magnitude of spill effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of spills, the species assemblage present, climate, and the spill response tactics employed.

Lighting is not expected to affect the piping plover since only one bulb would be used at each pump station above the entry door, none of which are located closer than 5 miles to a river with suitable habitat. Communication towers would be below the height that requires lighting by the Federal Aviation Administration, and below the height where guy wires would be required for tower stability.

All river crossings that provide suitable nesting habitat or migration stopover habitats would be crossed using HDD. There is limited information on the effects of pipeline temperatures in relation to surface water and wildlife. Because the depth of the pipeline is buried greater than 20 feet below the river bottom using the HDD construction method, temperature effects should be negligible. According to Keystone's Pipeline Temperature Effects Study (see Appendix F), the pipeline does have some effect on surrounding soil temperatures, but the burial depth under rivers crossed using HDD would avoid any temperature effects on potentially used habitats.

Power Lines and Substations

The construction of about 378 miles of new power lines to support the proposed Project would add to the incremental collision mortality of migrant piping plovers, especially where these power lines are located near migration staging, nesting, or foraging habitats. Piping plovers are susceptible to collisions with power lines. Construction of new power line segments across nesting and foraging habitats, including rivers, gravel pits, alkali lakes, and lake shorelines would also potentially increase predation from raptors by creating perches. Based on the habitat and occurrence surveys for this species at the Platte River crossing, breeding habitat quality within line of sight of the proposed Project centerline was considered to be of good quality.

Avoidance and minimization measures could then be implemented by electrical service providers to minimize or prevent collision risk to foraging interior piping plovers at the Platte River crossing with the use of standard measures as outlined in *Mitigating Bird Collision with Power Lines* (APLIC 1994). Electrical power line providers would be responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments. Keystone has advised electrical power providers of their ESA consultation requirement with the USFWS for the electrical infrastructure component of the proposed Project to prevent impacts to migrating, nesting, or foraging piping plovers. To prevent impacts to nesting and foraging piping plovers and impacts to other threatened and endangered species, electrical power providers have made commitments to consult with the USFWS for the electrical infrastructure components constructed for the proposed Project. These commitments are included in Appendix A, Letters of Section 7 Consultation Commitments from Power Providers. Conservation measures applicable to power lines are presented below.

3.2.1.4 Cumulative Impacts

The proposed Project could potentially affect four federally protected or candidate migratory birds (whooping crane, piping plover, interior least tern, and Sprague's pipit) within their migration range from Nebraska to Montana and/or within their breeding habitats. Conservation measures proposed for three of these birds (i.e., whooping crane, piping plover, and interior least tern) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize effects to these birds.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for the four federally protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds, including the greater sage-grouse (although not a migratory bird), interior least tern, piping plover, and Sprague's pipit.

Impacts to federally protected and candidate species from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term or permanent. The greater sage-grouse, Sprague's pipit, and federally protected species may be impacted by habitat loss resulting from construction of the Bakken Marketlink Project, along with future projects in the area that reduce and fragment preferred habitat for these species. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on these species.

The transmission line, electrical distribution lines, and substations could result in long-term increased bird collisions, bird predation, and habitat loss. However, with implementation of conservation measures, it is not expected that these lines would have cumulative impacts on birds protected under the MBTA or Bald and Golden Eagle Protection Act. Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds.

3.2.1.5 Conservation Measures

Keystone XL Pipeline Project

The following conservation measures would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the piping plover nesting season within suitable habitat:

- If construction were to occur during the plover nesting season (April 15 through September 1), Keystone would conduct pre-construction surveys within 0.25 miles from suitable breeding habitat at the Platte, Loup, and Niobrara rivers in Nebraska to ensure that there are no nesting pairs within 0.25 mile of the construction area. Daily surveys for nesting terns should be conducted when construction activities occur within 0.25 mile of potential nesting habitat during the nesting season.
- If occupied piping plover nests are found, then construction within 0.25 mile of the nest would be suspended until the fledglings have left the nest area.
- Directional lighting would be used should night time operations occur during HDD and a vegetative screen is limited.

Power Lines and Substations – All Segments

The following conservation measure would apply to power distribution lines to pump stations which cross rivers with good breeding habitat (and within 0.25 mile of each side) and between rivers and sand and gravel mining areas to reduce current and future potential for injury or mortality to piping plovers:

- Distribution lines supplying power to pump stations should be marked with bird deflectors where they cross rivers and within 0.25 mile of each side and between rivers and sand and gravel mining areas to reduce potential injury or mortality to piping plovers.

Additional conservation measures to avoid or minimize adverse impacts to piping plovers from new power lines will vary depending on the circumstances, but may also include the following measures.

- Reroute power lines to avoid construction within 0.50 mile of piping plover nesting areas in alkali wetlands in Montana.
- Mark new power lines with bird flight diverters (preferably Swan Spiral diverters or Firefly diverters) within 0.25 mile of piping plover nesting sites on river systems and commercial sandpit areas.

- If power line construction occurs during the piping plover nesting season, survey potential riverine or sand pit piping plover nesting areas within 0.25 mile of new power lines and within 2 weeks of construction to determine presence of nesting piping plovers. If nesting piping plovers are present, construction would cease until all piping plover chicks fledge from the site.

3.2.1.6 Determination

Effect on Critical Habitat

Critical habitat designated for the Northern Great Plains population of the piping plover has been vacated by the USFWS in Nebraska. Critical habitat is designated for the piping plover at Fort Peck Reservoir and on the Missouri River downstream of Wolf Point; this is in the vicinity of the proposed Project in Montana. However, based on Keystone's commitment to implement the conservation measures including implementation of HDD and power providers commitments to consult with the USFWS and to implement avoidance and minimization measures for power lines, the Department has determined that the proposed Project would not result in the destruction or adverse modification of federally designated critical habitat for the species.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" the piping plover. This determination is based on Keystone's construction plan to HDD the Platte, Loup, and Niobrara rivers, consultation with the USFWS, Keystone's commitment to follow recommended conservation measures identified by the USFWS, and power providers commitment to consult with and follow recommended conservation measures of the USFWS.

Although it is possible that a spill event could result in an adverse effect on this species, the probability of such an event would be unlikely due to the low probability of a spill, the low probability of a spill in a river reach where and when piping plovers are present, and the low probability of the spill reaching a major river in sufficient amounts to cause toxic effects. In the unlikely event of a leak, the crude oil would need to penetrate a significant amount of overburden before reaching the river, thereby reducing the risk in some cases of crude oil reaching the river and the potential for exposure.

3.2.2 Western Prairie Fringed Orchid - Threatened

3.2.2.1 Natural History and Habitat Association

The western prairie fringed orchid (*Platanthera praeclara*) was listed as federally threatened on September 28, 1989 (54 FR 39857). This plant is an erect, stout herbaceous perennial that historically occurred throughout the tallgrass prairies of southern Canada and the central United States west of the Mississippi River (USFWS 1996; Sieg and King 1995). A 60 percent decline is attributed to the conversion of much of the tallgrass prairie to agricultural land (USFWS 1996). The western prairie fringed orchid is presently known to occur in 6 states (Iowa, Kansas, Minnesota, Missouri, Nebraska, and North Dakota) and Manitoba, Canada; and appears to be extirpated from Oklahoma (USGS 2006; USFWS 1996). No known populations of the western prairie fringed orchid are known to exist in South Dakota, but this may be due to the lack of surveys in some areas and denied access to some private land (USFWS 2012b). Tripp County

South Dakota has much potential habitat for the species (USFWS 2012b). Most remaining populations are found in North Dakota and Minnesota, with about 3 percent of the populations found in the southern portion of this plant's historic range (USFWS 1996).

Pollination appears to be dependent on a specific group of moths known as hawkmoths (*Sphingidae*) (Phillips 2003, Sieg and King 1995, Sheviak and Bowles 1986). This relationship has been difficult to document (Phillips 2003). The long nectar spur of western prairie fringed orchid, the longest of any orchid in North America, requires its pollinators to have long enough tongues and widely spaced eyes to allow them to harvest the pollen (Phillips 2003). Based on historic documents, hawkmoths that may be possible pollinators include *Eumorpha acemon*, *Hyles lineata*, *Sphinx drupiferatum*, *S. kalmiae*, *Catacola* sp., *Ceratomia undulosa*, and *Hyles galli* (USFWS 1996). While western prairie fringed orchids are pollinator-specific, the hawkmoths have other nectar sources (Phillips 2003, USFWS 1996). It is theorized that a lack of suitable pollinators could contribute to the observed low pollination rates which may affect the long-term survival of the western prairie fringed orchid (Phillips 2003).

The western prairie fringed orchid is most commonly found in moist, undisturbed mesic to wet calcareous prairies, sedge meadows and mesic swales (Phillips 2003, Sieg 1997, USFWS 1996). Populations of western prairie fringed orchids vary dramatically between wet and dry years, with increases in wet years, and decreases in dry years (Sieg and Wolken 1999). Soil moisture appears to be the most significant factor in the survival of individual orchids and the number of orchids flowering in a given year (USFWS 2007, Phillips 2003, Sieg 1997, Sieg and King 1995). Periodic fires and bison grazing were common in the historic ranges of western prairie fringed orchid (Sieg and Bjugstad 1994), but it is unclear how fire or grazing may have affected the species (USGS 2006).

The spread of invasive plants into prairie swales has had a negative effect on western prairie fringed orchid populations (Sieg 1997, USFWS 2007). Invasive plants which may displace the western prairie fringed orchid through competition include: leafy spurge (*Euphorbia esula*), Kentucky bluegrass (*Poa pratensis*), and Canada thistle (*Cirsium arvense*) (Sieg 1997, USFWS 2007). Other threats to the long-term survival of western prairie fringed orchid include the use of herbicides, heavy livestock grazing, early haying, habitat fragmentation, river channelization, siltation, water depletions, and road and bridge construction (Minnesota Department of Natural Resources 2007, USGS 2006, USFWS 2012b).

3.2.2.2 Potential Presence in Project Area

The western prairie fringed orchid is found in Nebraska and Kansas (NatureServe 2009) and is likely to occur in South Dakota given the availability of suitable habitat, especially south of Highway 18 in Tripp County in South Dakota (USFWS 2012b). Known distribution of the species includes the counties of Holt, Antelope, and Boone in Nebraska (AECOM 2008a, NGPC 2011). Populations in South Dakota are possibly extirpated (NatureServe 2009) but factors that indicate the species could still be present include incomplete surveys in areas of suitable habitat crossed by the proposed Project route on private lands, and erratic flowering patterns with long dormancies that make detection difficult (Phillips 2003).

Surveys to assess habitat suitability and occurrence of the western prairie fringed orchid were completed in June 2009 and May through June 2011 and 2012 (Appendices B and C [NOTE: Listed and Special Status Survey Repts]). Surveys were conducted in suitable habitat in Tripp

County, South Dakota, and Holt, Greeley, and Wheeler counties in Nebraska in May and June 2009 and 2011. Surveys were conducted in suitable habitat in Holt, Antelope, and Boone counties in Nebraska along reroutes within that state in May and June 2012. One western prairie fringed orchid was located in 2009 at a wetland on the previous proposed Project route. Two plants were located at that same site in 2011. No western prairie fringed orchids were located along the proposed Project route in Nebraska in 2012 although suitable habitat was present in several areas, while other areas of potentially suitable habitat were not surveyed due to access denial. The western prairie fringed orchid will be assumed to be present if suitable habitat is present but access to survey for the species was denied.

Populations are known to occur in Boone, Cherry, Dodge, Garfield, Grant, Greeley, Hall, Holt, Lancaster, Loup, Madison, Otoe, Pierce, Rock, Saline, Sarpy, Seward, and Wheeler counties, and may occur at other sites in Nebraska. The species can be impacted through disturbance to its habitat. This plant may also be impacted by alterations to the hydrology of sub-irrigated wetland habitat areas along the Platte River resulting from depletions to the Platte River system.

3.2.2.3 Impact Evaluation

Construction

Construction of the proposed pipeline could potentially disturb western prairie fringed orchid communities when vegetation is cleared and graded. Construction of permanent ancillary facilities also could displace plant communities for the lifetime of the proposed Project. Revegetation of the proposed pipeline ROW could introduce or expand invasive species, especially leafy spurge, Kentucky bluegrass, and Canada thistle into the Project area, potentially contributing to the decline of western prairie fringed orchid. Keystone has developed weed and vegetation monitoring plans to prevent the spread of invasive species as a consequence of the proposed Project construction and operation. These plans are discussed in Sections 2.13 and 4.16 of the CMRP (Appendix B), respectively, and would be updated prior to construction.

Impacts to the western prairie fringed orchid or suitable habitats for this plant from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided, based on Keystone's plan to withdraw the volume of water needed at a rate less than 10 percent of the baseline daily flow and to return water back to its source within a 30-day period and the small volume of water to be used in comparison to total basin water flow.

Operations

Operation of the proposed Project is not expected to result in impacts to the western prairie fringed orchid. Clearing of trees/shrubs in the ROW would be required for operational monitoring, but since this species inhabits open, native prairie, no tree or shrub clearing would occur within suitable habitat. If herbicides must be used for noxious weed control, application would be conducted by spot spraying. Populations of western prairie fringed orchid would be identified and no herbicides would be used at those locations.

Direct contact with a crude oil spill could result in adverse toxicological effects to the western prairie fringed orchid. While these exposure routes have the potential to cause adverse effects, the probability of adverse effects to western prairie fringed orchid are unlikely due to the low probability of a spill, low probability of the spill coinciding with western prairie fringed orchid populations, and low probability of a spill reaching occupied habitats in sufficient amounts to cause toxic effects (see Appendix G, Pipeline Risk Assessment and Environmental Consequence Analysis).

According to the Pipeline Temperature Effects Study (Appendix F), the pipeline does have some effect on surrounding soil temperatures, primarily at pipeline depth, in an area surrounding the pipe. Effects of pipeline-elevated soil temperatures vary seasonally. Heat effects in soil near the surface, where most plant root systems are located, are less pronounced than near soil around the pipe. Surficial soil temperatures relevant to vegetation are impacted mainly by climate (such as air temperature and plant water availability) with negligible effect attributed to the operating pipeline. This is because the largest increase in temperature, in the summer months, is found within 24 inches of the pipeline. In addition, a minimum of 4 feet of cover over the top of the pipeline would result in minimal impacts to vegetation. Therefore, there would be no effects of heat dissipation from the pipeline for the western prairie fringed orchid.

Power Lines and Substations

The construction of new electrical power line segments could impact the western prairie fringed orchid if power line ROWs were to disturb potential habitat for this species. Protection measures that could be implemented by electrical service providers to prevent impacts to this species would be the same as described below under Conservation Measures. Electrical power line providers would be responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments. Keystone would advise electrical power providers of their ESA consultation requirement with the USFWS for the electrical infrastructure components constructed for the proposed Project to prevent impacts to the western prairie fringed orchid.

3.2.2.4 Cumulative Impacts

The spread of invasive plants could result in cumulative habitat impacts to federally protected plants, if present. Implementation of appropriate conservation measures as determined through consultations with federal and state agencies for federally protected and candidate species for the proposed Project would include impact avoidance, minimization, and habitat restoration and compensation to ameliorate long-term cumulative impacts. Proposed Project restoration includes restoration of native vegetation and soil conditions and prevention of spread and control of noxious weeds for disturbed areas. Unavoidable alteration and maintenance of vegetation structure to ensure pipeline safety and to allow for visual inspection would result in some conversion of tall shrub and forested habitats to herbaceous habitats. These conversions are not expected to adversely affect or contribute to cumulative impacts for any federally protected and candidate species.

3.2.2.5 Conservation Measures

Keystone commits to implementation of the following conservation measures for western prairie fringed orchid for areas where surveys have been done and where the species was found or where suitable habitat is present:

- Complete presence/absence surveys prior to construction within areas identified with potentially suitable habitat that were not previously surveyed. Submit survey results to the USFWS for review. If surveys cannot be conducted during the blooming period and suitable habitat is present, it will be assumed the species is present;

- Routing the pipeline around individual plants or populations within the proposed Project footprint;
- Transplanting individual plants that would be affected by construction activities to other locations where suitable habitat is available, when feasible and/or when approved by land owner if on private land;
- Reducing the width of the construction ROW in areas where plant species populations have been identified, to the extent possible;
- Salvage and segregate topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in revegetation efforts in the ROW; and
- Restore wet meadow habitat using a seed mix approved by the USFWS and NGPC.
- Keystone would provide compensation for temporary construction and permanent operational impacts to the western prairie fringed orchid as part of a Trust. Compensation would be based on total acres impacted where western prairie fringed orchid presence was confirmed and in areas with suitable habitat that were not surveyed during the blooming period. Compensation would not be provided for habitat in areas where surveys were completed for western prairie fringed orchids and they were not found.
- Monitor restoration of construction-related impacts to wet meadow habitats identified as suitable for the western prairie fringed orchid consistent with USACE guidelines which indicate monitoring for a 5-year period for successful re-establishment of wetland vegetation.

3.2.2.6 Determination

Effect on Critical Habitat

Critical habitat has not been designated for this species. Therefore, the proposed Project would not result in the destruction or adverse modification to federally designated critical habitat for the western prairie fringed orchid.

Effect on Species

The proposed Project “may affect, but is not likely to adversely affect” the western prairie fringed orchid. This determination is based on the proposed Project route’s proximity to the extant western prairie fringed orchid range, the presence of an identified and avoided population, the existence of suitable habitat within the proposed Project area, Keystone’s commitment to implement avoidance and conservation measures that includes providing compensation for impacts to the western prairie fringed orchid where presence has been confirmed and where suitable habitat, as identified by the USFWS, has not been surveyed, and power providers will consult with the USFWS regarding ways to minimize or mitigate impacts to the western prairie fringed orchid and other threatened and endangered species affected by construction and follow recommended avoidance and conservation measures of the USFWS.

3.3 FEDERAL CANDIDATE SPECIES

3.3.1 Greater Sage-Grouse– Candidate

3.3.1.1 Natural History and Habitat Association

The greater sage-grouse (*Centrocercus urophasianus*) was identified as a candidate species under the Endangered Species Act of 1973, as amended on March 5, 2010 (75 FR 13910) and accordingly is not at present provided federal protection under the ESA. For purposes of the proposed Project, the greater sage-grouse has been analyzed because it is a federal candidate species. As a federal candidate species, the greater sage-grouse is a species in decline that the USFWS believes needs to be listed as threatened or endangered, but listing is currently precluded by other priorities.

Greater sage-grouse is a BLM sensitive species, a Montana species of concern, and a South Dakota species of greatest conservation need. Critical habitat has not been identified for greater sage-grouse but they are considered a sagebrush obligate species (Braun et al. 2001). Core habitat has been designated in Montana. Greater sage-grouse are the largest grouse species in North America; the wingspan of a male greater sage-grouse can be up to 97 cm with a weight of up to 3.2 kg (Montana Field Guide 2012a). The greater sage-grouse is a large, rounded-winged, ground-dwelling bird, up to 30 inches long and two feet tall, weighing from two to seven pounds. It has a long, pointed tail with legs feathered to the base of the toes. The birds are found at elevations ranging from 4,000 to over 9,000 feet and are highly dependent on sagebrush for cover and food. Evidence suggests that habitat fragmentation and destruction across much of the species range has contributed to significant population declines over the past century.

Greater sage-grouse commonly use multiple habitats throughout the year (Braun et al. 2001, Connelly et al. 2004). Greater sage-grouse are lekking birds; males gather and perform mating displays for females at leks. After mating, females nest, on average, between approximately 2 to 4 miles and up to approximately 12 miles from the lek site. Important components of lek sites include relatively open habitats with minimal sagebrush. Nesting habitat includes moderate amounts of sagebrush cover (about 23 percent) with varying heights, residual grass cover, and live forb cover. Brood-rearing habitat is defined as either early or late-season brooding habitat. Early-season habitat is comprised of relatively open stands of sagebrush and high herbaceous cover while late-season habitat is comprised of riparian meadows or hay ground that supports succulent herbaceous vegetation and has a surrounding buffer of sagebrush. Winter habitat is comprised of areas where sagebrush extends 25 to 35 cm above the snow or where sagebrush is blown free of snow by wind (Braun et al. 2001).

Greater sage-grouse have historically occupied sagebrush habitats in 13 states throughout the western United States, including Washington, Oregon, California, Nevada, Utah, Idaho, Montana, North Dakota, South Dakota, Wyoming, Colorado, Arizona, and New Mexico (Wallestad 1975). Today greater sage-grouse still occupy reduced ranges within most of these states, but have apparently been extirpated from Arizona and New Mexico (USFWS 2012c). Greater sage-grouse population decline has been a concern for over 90 years and was first expressed by Hornaday in 1916 (Hornaday 1916).

More recently, greater sage-grouse population data were analyzed and results showed a decline of 17 to 47 percent in breeding populations within nine western states and one Canadian province;

greater sage-grouse populations were classified as secure in five states, with populations in six states and two provinces classified as at risk (Connelly and Braun 1997). Declines in greater sage-grouse populations appear to be less from 1986 to 2003 (0.4 percent annual decline) than from 1965 to 1985 (2.0 percent annual decline) (Connelly et al. 2004), but the overall trend in greater sage-grouse populations has continued downward until the present (Garton et al. 2011). Specific to the proposed Project area, active greater sage-grouse leks in northern Montana, north of the Missouri River, are estimated to have declined by 22 percent from 1965 to 2007; active greater sage-grouse leks in southeastern Montana have declined by 27 percent from 1970 to 2007; and active greater sage-grouse leks in the Dakotas have declined by 20 percent from 1965 to 2007 (Garton et al. 2011).

Declines in greater sage-grouse populations have been attributed primarily to the loss of sagebrush habitat from agriculture, altered fire regimes, cheatgrass (*Bromus tectorum*) invasion, and more recently, energy development, primarily oil and gas development and wind farm development (Doherty et al. 2011, Johnson et al. 2011).

3.3.1.2 Potential Presence in Project Area

Greater sage-grouse are known to inhabit sagebrush habitats in the proposed Project area between the Canada/Montana border and northwestern South Dakota. Greater sage-grouse can occur throughout central and eastern Montana in suitable sagebrush habitats year-round, and are known from Beaverhead, Big Hom, Blaine, Carbon, Carter, Chouteau, Custer, Dawson, Fallon, Fergus, Gallatin, Garfield, Golden Valley, Hill, Liberty, Madison, McCone, Meagher, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Valley, Wheatland, Wibaux, and Yellowstone counties. Greater sage-grouse are found in Butte, Fall River, and Harding counties, South Dakota (USFWS 2012b).

Since issuance of the August 2011 Final EIS, the BLM issued, through Instruction Memorandum No. 2012-043, *Greater Sage-Grouse Interim Management Policies and Procedures* (Interim Policy) in order to maintain or promote sustainable greater sage-grouse populations and conservation of its habitat (BLM 2011). The Interim Policy identifies policies and procedures to minimize habitat loss in Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH) areas. PPH in Montana are the MFWP delineated core areas, which are the highest conservation value habitats, as determined by coordination between BLM and MFWP. The BLM is coordinating with the respective state wildlife agency in Montana and with SDGFP in accordance with the Interim Policy, although federal lands are not involved with the proposed Project in South Dakota. Several BLM PPHs exist in Harding County, South Dakota. The proposed Project crosses PPH within one area of South Dakota, on private lands which are not applicable to the Interim Policy.

Greater sage-grouse management is the responsibility of MFWP in Montana and the responsibility of SDGFP in South Dakota. In addition, the *Management Plan and Conservation Strategies for Sage-Grouse in Montana* includes information on the identification of important seasonal habitats and recommended management practices to avoid impacts (Montana Sage Grouse Work Group 2005).

Surveys for this species have been carried out and Keystone, in consultation with USFWS South Dakota Ecological Services Field Office and SDGFP, has prepared a draft supplemental mitigation plan for the greater sage-grouse that is currently under review. Keystone has completed surveys within a 4-mile radius of the proposed Project components to locate greater sage-grouse leks, or monitor known leks, since 2010 (Appendix L, Summary of April 2010 Aerial Searches for Greater Sage-grouse Leks, Keystone XL Pipeline Project Steele City Segment). The 4-mile radius used for locating greater sage-grouse leks was developed based on agency recommendations and includes a survey buffer to accommodate future route modifications. In 2011, Keystone monitored 46 lek sites within Montana and South Dakota; displaying male greater sage-grouse were observed at 35 lek sites (WESTECH 2011a) (Appendix M, Summary of April 2011 Aerial Searches for Greater Sage-grouse Leks, Keystone XL Pipeline Project Steele City Segment). In 2012, displaying males were observed at 18 of the same leks (Appendix N, 2012 Aerial Searches for Grouse Leks). In total, the MFWP and SDGFP consider 28 of these leks to be active in any given year.

3.3.1.3 Impact Evaluation

Construction

Greater sage-grouse would be especially vulnerable to pipeline construction activities in spring when birds are concentrated on strutting grounds (leks) and where the proposed Project pipeline and access roads would be constructed through sagebrush communities with leks and nesting sage-grouse. An estimated 35 recently active lek sites within 4 miles of the proposed Project could potentially be occupied by sage-grouse (WESTECH 2012) during construction. Construction near active leks could displace breeding birds from leks or disturb nests, resulting in a decrease in their reproduction. Traffic on roads near active leks could cause vehicle collision and greater sage-grouse may not survive.

Construction would increase noise levels in the vicinity of the project activities (see the Supplemental EIS, Section 4.12.3.3, Noise Construction Impacts). Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. In addition, construction-related sound levels would vary by distance. Recent studies suggest that greater sage-grouse avoid leks with anthropogenic noise and that intermittent noise may have a greater effect than continuous noise (Blickley et al. 2012) and that low frequency noise could affect mate assessment for lekking greater sage-grouse (Blickley and Patricelli 2012).

Courtship and breeding behavior disruption could be minimized by scheduling construction after birds have left the leks (usually by mid-May). Mortality to greater sage-grouse and loss of nests, eggs, and young could be avoided by scheduling construction through occupied sagebrush steppe habitats after young sage-grouse have become mobile and are able to fly (usually by mid-August). Greater sage-grouse chicks are precocious and are capable of leaving the nest shortly after hatching, but they may not be sufficiently mobile to avoid construction related impacts until after they can fly.

After construction, re-establishment of sagebrush to pre-disturbance cover levels on the ROW may take many years depending on the type of sagebrush, subsequent soil moisture, and extent of competition from invasive annual plants or perennial grasses. During this period, vegetation on reclaimed areas would likely be dominated by grasses with low shrub densities. The cleared ROW and the three new permanent access roads in Montana and one new permanent access road in South Dakota may encourage recreational use of the ROW. Recreational use (e.g., motorized vehicles, wildlife viewing) of the area during the breeding season could have an adverse effect on sage-grouse reproduction.

Three new permanent access roads in Montana and one new permanent access road in South Dakota would be constructed. One new access road in Montana is within 4 miles of a confirmed active greater sage-grouse lek. The new access road in South Dakota is within 4 miles of a lek located in Montana where greater sage-grouse were observed in 2010, 2011, and 2012. However, none of these roads would be visible from the leks.

Three of the six proposed pump stations in Montana (PS-10, PS-11, and PS-14) would be constructed within 4 miles of confirmed active leks. PS-10 is approximately 3.4 miles from Lek 744 and is not visible from the lek. PS-11 is approximately 2.9 miles from Lek 619, a confirmed active lek in the agency database but one which has not been surveyed by agencies since 1996 and where Keystone has not observed greater sage-grouse for 3 consecutive years. PS-11 is also within 3.7 miles of Lek 1738, a lek of unconfirmed activity status where Keystone has not observed greater sage-grouse in 3 consecutive years. The pump station is not visible from either of these lek sites.

PS-14 is approximately 2.7 miles from confirmed active leks 1805 and 1430, but is not visible from either lek. PS-14 is also within 2.4 miles of Lek 1725 which has unconfirmed activity. Keystone surveys have not observed any greater sage-grouse at Lek 1725 for 3 consecutive years. Agency surveys at the lek did not observe greater sage-grouse in 2011.

One new pump station in South Dakota (PS-15) would be constructed within 3.2 miles of Lek 1437, a confirmed active lek in Montana. The pump station is not visible from Lek 1437 because of terrain. A second pump station in South Dakota (PS-16) would be constructed within 1.3 miles of the active Squaw Creek Lek.

Pipe yard 12 in South Dakota is 1 mile away from the KXL-195 Hoover lek where greater sage-grouse have been observed for 3 consecutive years. This pipe yard is dominated by grasses and is not high-quality greater sage-grouse habitat. Pipe yards are cleared of vegetation and are used to store and retrieve pipes for pipeline construction.

Operations

Noise from the pump stations would attenuate to background levels within 0.5 miles from the proposed pump stations and would not be expected to cause disturbance to greater sage-grouse leks because no recently active leks were identified within 0.5 mile of proposed pump stations in Montana or South Dakota (i.e., all pump stations are greater than 0.5 mile from the nearest lek). Communication towers associated with the proposed pump stations could lead to increased collision hazard and increased predation by raptors by providing vantage perches.

Human activity at the pump stations would be relatively minor and not above normal background levels at any pump station that is within 2 miles of an active lek. The only lek that is within 2 miles of a pump station is the Squaw Creek Lek, which is adjacent to a gravel county road that currently receives occasional daily traffic. Overflights by aircraft could disrupt greater sage-grouse that are at leks in the early morning or possibly evening. Typically overflights are scheduled at least one hour after sunrise, a time when lek activity would be naturally decreasing.

Power Lines and Substations

The construction of electrical distribution lines to pump stations in Montana and South Dakota would incrementally increase habitat alteration and predation hazards for feeding and nesting greater sage-grouse in the proposed Project area. Construction of these distribution lines during the breeding season could also potentially disturb breeding, nesting, and brood-rearing birds. Power lines across native grassland habitats may contribute to fragmentation. Keystone would not construct or operate these electrical distribution lines, but would inform electrical power providers of the candidate status of the greater sage-grouse, and would encourage consultations with Montana and South Dakota regulatory agencies for the electrical infrastructure components constructed for the proposed Project, to prevent impacts to greater sage-grouse.

3.3.1.4 Cumulative Impacts

Short, medium or long-term loss or alteration of native grassland and sagebrush habitats through the spread of invasive plants in Montana and South Dakota from previous projects in addition to similar impacts from the proposed Project could contribute to cumulative habitat impacts for federal candidate birds, including the greater sage-grouse.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could provide perches on towers and poles that could increase the cumulative predation mortality for ground nesting birds, including the greater sage-grouse (although not a migratory bird), interior least tern, piping plover, and Sprague’s pipit. The Bakken Marketlink facilities would be constructed near known greater sage-grouse lekking sites, and, therefore, construction could affect greater sage-grouse or their habitat. The proposed alternative corridors for the Big Bend to Witten 230-kV transmission line in southern South Dakota are generally outside of the range of breeding greater sage-grouse (USFWS 2010), and construction of a transmission line would be unlikely to affect the greater sage-grouse.

3.3.1.5 Conservation Measures

USFWS recommends that pre-construction surveys for greater sage-grouse suitable habitat and leks be completed along the pipeline route. The Department has been in consultation with the USFWS, BLM, MFWP, and the SDGFP to consider the effects of the proposed Project on this species including conservation measures, habitat fragmentation, potential avoidance, minimization, and conservation measures. Conservation measures would be implemented by Keystone to avoid, minimize, and compensate for impacts to the sage-grouse. Many of these measures were described in *An Approach for Implementing Mitigation Measures to Minimize the Effects of Construction and Operation of the Keystone XL Pipeline Project on Greater Sage-Grouse* (Appendix O) and *An Approach for Implementing Mitigation Measures to Minimize the Effects of Construction and Operation of the Keystone XL Pipeline Project on Greater Sage-Grouse in South Dakota; and Associated Correspondences* (Appendix P). In South Dakota, this strategy was supplemented with compensatory mitigation that was outlined in a proposal submitted to SDGFP in November 2011 and revised in November 2012 (Appendix P). Those measures, as well as measures that were identified in the Final EIS, include the following:

- Conduct surveys of greater sage-grouse leks prior to construction using approved methods to determine lek locations and peak number of males in attendance within 3 miles of the facility unless the facility is screened by topography; also survey leks identified by MFWP, BLM, and SDGFP more than 3 miles from the facility for use as a baseline to determine construction effects on sage-grouse abundance.

- Develop a conservation plan with MFWP, SDGFP, USFWS, and BLM to address impacts to greater sage-grouse, including construction timing restrictions, habitat enhancement, and any mitigation measures that would be necessary to maintain the integrity of Core Areas or Preliminary Priority Habitat/Protection Priority Areas (USFWS 2012b), which encompasses lek habitats as well as other important habitat necessary for greater sage-grouse to meet life requisites (see Appendices O and P, Sage Grouse Mitigation Plans).
- Follow all protection and mitigation efforts as identified by USFWS and SDGFP including identify all greater sage-grouse leks within the buffer distances from the construction ROW set forth for the greater sage-grouse by USFWS, avoid or restrict construction activities as specified by USFWS within buffer zones between March 1 and June 15 (see Appendices O and P, Sage Grouse Mitigation Plans.
- Construction within 3 miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography would be prohibited during March 1 to June 15, with an allowance for one-time equipment movement during mid-day hours through ROW areas with timing restriction that do not require grading for equipment passage to lessen disturbance to sage-grouse leks.
- Construction within 2 miles of active greater sage-grouse leks on federal land would be prohibited during March 1 to June 15.
- Reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes in sagebrush habitat, additional measures would be taken to compact backfilled spoils to reduce settling.
- Establish a compensatory mitigation fund for use by MDEQ, MFWP, and BLM to enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana (size of the fund to be based on acreage of silver sagebrush and Wyoming big sagebrush habitat disturbed during pipeline construction within sage-grouse core habitat mapped by MFWP and important habitat between approximate Mileposts 95 to 98 and 100 to 121.
- Limit inspection over-flights to afternoons from March 1 to June 15 during operations as practicable in sagebrush habitat designated by MFWP.
- Fund a 4-year study, under the direction of MDEQ, MFWP, and BLM, that would show whether the presence of the facility has affected greater sage-grouse numbers based on the peak number of male sage-grouse in attendance at leks.
- Implement restoration measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeding rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas where compatible with the surrounding land use and habitats unless otherwise requested by the affected landowner.

- Prior to construction, conduct studies along the route to identify areas that support stands of silver sagebrush and big sagebrush and incorporate these data into restoration activities to prioritize reestablishment of sagebrush communities.
- Monitor and report on establishment of sagebrush on reclaimed areas, unless otherwise requested by the landowner, annually for at least 4 years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities and implement additional sagebrush seeding or planting if necessary.
- Establish criteria in conjunction with MDEQ, MFWP, and BLM to determine when restoration of sagebrush communities has been successful based on pre- and post-construction studies in addition to revegetation standards.
- Use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed, unless otherwise requested by the affected landowner (seed would be collected as close to the Project as practicable as determined by regional seed production and availability).
- Monitor cover and densities of native forbs and perennial grasses exclusive of noxious weeds on reclaimed areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities.
- Work in conjunction with the landowner to appropriately manage livestock grazing of reclaimed areas until successful restoration of sagebrush communities has been achieved (livestock grazing in restored sagebrush communities may promote establishment of sagebrush).
- Implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass to the extent that these plants do not exist in undisturbed areas adjacent to the ROW (noxious weed management plans would be developed and reviewed by appropriate county weed specialists and land management agencies for each state crossed by the proposed Project).
- Establish a compensatory mitigation fund for temporary and permanent impacts to greater sage-grouse habitat for use by SDGFP to enhance and preserve sagebrush communities within the sagebrush ecosystem in South Dakota, which is found within the following counties: Butte, Custer, Fall River, and Harding counties and to a lesser degree, Perkins and Meade counties.
- Develop a research fund, in consultation with SDGFP, and managed by a third party to evaluate the effects of pipeline construction on greater sage-grouse.
- Monitor leks that are within 3 miles of the project footprint in South Dakota that are within the viewshed of the construction ROW if construction takes place between March 1 and June 15.
- Implement, in consultation with SDGFP, a modified 3-mile buffer between March 1 to June 15 around active greater sage-grouse leks. The buffer would be modified on a lek-by-lek basis to account for differences in topography, habitat, existing land uses, proximity of the Project to the lek, and line-of-sight between the proposed Project and each lek.
- Restrict construction equipment activity in South Dakota to occur only between 10 am and 2 pm to avoid impacts to breeding greater sage-grouse from March 1 through June 15 in areas

where a lek is either within 3 miles of the ROW and visible from the ROW; or within 1 mile of the ROW.

3.3.1.6 Determination

Effect on Critical Habitat

The proposed Project would not result in the destruction or adverse modification of federally designated critical habitat for greater sage-grouse as none has been identified for the species.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" greater sage-grouse. This determination is based on Keystone's commitment to follow recommended conservation measures identified by the USFWS and state agencies, and Keystone's commitment to implement avoidance and conservation measures including providing compensation for impacts to greater sage-grouse habitat in Montana and South Dakota. As a result, no direct impacts are expected to result from construction. Indirect impacts from disturbance to sage-grouse during proposed Project construction and operation are expected to be short-term, temporary, or minimal.

Although it is possible that a large spill event could result in an adverse effect on this species and its habitat, the probability of adverse effects to sage-grouse are unlikely due to the low probability of a spill, low probability of the spill coinciding with important sage-grouse habitats, and low probability of a sage-grouse contacting the spilled product.

3.3.2 Sprague's Pipit - Candidate

3.3.2.1 Natural History and Habitat Association

Sprague's pipit (*Anthus spragueii*) was identified as a candidate species under the Endangered Species Act of 1973, as amended on September 15, 2010 (75 FR 56028), and accordingly is not at present provided federal protection under the ESA. However, Sprague's pipit is a migratory bird that is protected under the MBTA. For purposes of the proposed Project, Sprague's pipit has been analyzed because it is a federal candidate species. As a federal candidate species, Sprague's pipit is a species in decline that the USFWS believes needs to be listed as threatened or endangered, but listing is currently precluded by other priorities.

Sprague's pipit is a small, grassland-dwelling, migratory songbird (USFWS 2012b). Adults reach a length of approximately 16.5 cm with a wingspan of approximately 25.4 cm. Sprague's pipits are extremely secretive on the ground and are often identified by their song which is a "high-pitched, thin 'jingling' sound" (Montana Field Guide 2012b). Sprague's pipit is an endemic species to grasslands preferring areas with medium to intermediate height vegetation; the species is more abundant in native prairie than in areas that have been seeded with, or invaded by, introduced grasses (Casey 2000, Dechant et al. 2003). Sprague's pipit requires relatively large areas of undisturbed habitat, with a potentially minimum area requirement of 190 hectares (Dechant et al. 2003). In addition to native grasslands, Sprague's pipits have been recorded in alkaline meadows and the edges of alkaline lakes (Johnsgard 1986).

Sprague's pipits breed throughout the northern Great Plains with their highest numbers in the native mixed-grass prairie of north-central, and eastern Montana, to North Dakota and northwestern and north-central South Dakota (Jones 2010). Migration occurs through the central

Great Plains in April and May and late September through early November (Jones 2010). Sprague's pipits are ground nesters in medium height, primarily native vegetation; nesting occurs between May and August (Jones 2010).

As of 2010 an estimated 870,000 Sprague's pipits were in North America, with populations declining approximately 3 percent per year since 1980 in the United States (Jones 2010). The species decline is primarily attributable to agriculture and subsequent habitat loss, degradation, and fragmentation through conversion to seeded pasture, hayfields, and croplands, as well as overgazing by livestock (Jones 2010). Sprague's pipits are also threatened by habitat loss and degradation from overgrazing, mowing, and reduced fire frequency; energy development; introduced and invasive plants; and drought (Jones 2010).

3.3.2.2 Potential Presence in Project Area

Sprague's pipits are known to occur in the Project area based on relative density and recent observations contained in the Montana Field Guide (2012b). Data indicate that the highest likelihood of Sprague's pipit within the proposed Project area is in native grasslands north of the Missouri River (Montana Field Guide 2012b), although the species is also known to occur in native grasslands in eastern Montana and northwestern South Dakota.

Specifically, breeding habitat for Sprague's pipits occurs in the 44.2 miles of the North Valley Grasslands Important Bird Area (IBA) which is crossed by the proposed Project. Sprague's pipit is relatively common in this area and exceed the globally significant threshold of this IBA (Montana Audubon 2012). Sprague's pipits also breed in flat to gently-rolling prairie areas in other eastern Montana counties that would be crossed by the proposed Project. Outside the habitat north of the Missouri River, the proposed Project would cross approximately 87 miles of native, mixed grass prairie that could serve as suitable habitat depending on grazing regimes and adjacent human activity.

In South Dakota Sprague's pipits are a rare summer resident in central and northwestern South Dakota within native prairie grasslands (Jones 2010). The proposed Project would cross approximately 119 miles of native, mixed grass prairie that could serve as suitable habitat depending on grazing regimes and adjacent human activity. Sprague's pipits are uncommon seasonal migrants in Nebraska (Jones 2010). Sprague's pipits were recorded as abundant during early European exploration. Currently, they are common only in remnant large grassland patches in the northern mixed-grass native prairie of North America. The decline of Sprague's pipits occurred as the short- and mixed-grass prairies were converted to agriculture.

Sprague's pipits are short-distance migratory birds, moving from breeding grounds in the central and western plains of the northern United States and southern Canada southward to the wintering grounds in the central grasslands of northern Mexico and the southern United States. Sprague's pipits are passerine birds about 14 cm in length. The wings and tail are dark brown with two pale indistinct wing-bars, the crown, nape, and upper parts are buffy with blackish streaking and the face is buffy with a pale eye-ring creating a large-eyed appearance. In South Dakota, they can be found in the following counties: Butte, Campbell, Corson, Custer, Dewey, Fall River, Haakon, Harding, Jackson, Jones, Lawrence, Lyman, McPherson, Meade, Pennington, Perkins, Shannon, Stanley, and Ziebach.

Sprague's pipits can occur throughout central and eastern Montana in suitable grassland habitats during nesting and migration seasons, and are known from Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, McCone, Meagher, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, and Yellowstone counties. The species has been confirmed in central Nebraska as it migrates through the state using grassland and wetland habitats.

Preconstruction surveys for suitable nesting habitat for the Sprague's Pipit would be completed along the proposed Project route.

3.3.2.3 Impact Evaluation

Construction

In Montana, data indicate that the highest likelihood of Sprague's pipit along the proposed Project route is in native grasslands north of the Missouri River (MNHP and MFWP 2012a). High quality breeding habitat for Sprague's pipits occurs in the 44.2 miles of the North Valley Grasslands Important Bird Area (IBA) which is crossed by the proposed Project route in the Glaciated Plains in northern Montana, where this species is relatively common. Outside of the habitat north of the Missouri River, the proposed Project route would cross approximately 87 miles of native, mixed grass prairie that could serve as suitable habitat for this species, depending on grazing regimes and adjacent human activity. In South Dakota, the proposed Project route would cross approximately 119 miles of native, mixed grass prairie that could serve as suitable habitat depending on grazing regimes and adjacent human activity. In Nebraska, Sprague's pipits are uncommon seasonal migrants (Jones 2010).

Construction through native prairie habitats could affect nesting Sprague's pipit if they are present and if construction occurs during the nesting season. Nests, eggs, and young could be lost during construction. Disturbance could lead to nest abandonment resulting in loss of eggs or young. Construction would also create temporarily unsuitable habitat for the species until revegetation is successful at establishing medium height, native grassland cover.

Operations

Operations of the proposed Project are expected to have little, if any, effect on the species. Travel to and from pump stations or valves will be along established roads that do not provide habitat for Sprague's pipit. Overflights would be at an elevation that should not negatively affect the species.

Power Lines and Substations

Electrical transmission lines associated with the proposed Project would slightly increase risk of collision for Sprague's pipit and increase the possibility of predation since the transmission line towers would provide perches for avian predators. The transmission line to proposed PS-10 would cross about 19 miles of the North Valley Grasslands IBA and about 2 miles of the Charles M. Russell National Wildlife Refuge IBA, both of these areas support breeding Sprague's pipit. Construction during the breeding season could potentially disturb nesting and brood-rearing birds.

Power transmission lines may also increase the likelihood of collisions for Sprague's pipits since they typically have high, ringing flights during the spring and summer (Peterson 1980). Keystone would not construct or operate these electrical distribution lines, but would inform electrical power providers of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the proposed Project to prevent impacts to nesting Sprague's pipit.

Cumulative Impacts

Short, medium, or long-term loss or alteration of native grassland and sagebrush habitats through the spread of invasive plants in Montana and South Dakota from previous projects in addition to similar impacts from the proposed Project could contribute to cumulative habitat impacts for federal candidate birds, including Sprague's pipit.

The proposed Project could potentially affect four federally protect or candidate migratory birds (whooping crane, piping plover, interior least tern, and Sprague's pipit) within their migration range from Nebraska to Montana and/or within their breeding habitats. Conservation measures proposed for three of these birds (i.e., whooping crane, piping plover, and interior least tern) include protection of river and riparian nesting and migration staging habitats through use of HDD crossing methods and site-specific surveys to avoid disturbance to migration staging, nesting, and brood-rearing individuals. Habitat and disturbance impacts at major river crossings from future linear projects would likely incorporate similar conservation measures to avoid and minimize effects to these birds.

Future electrical power transmission lines and the distribution lines that would serve pump stations and MLVs of the proposed Project or any other future projects could incrementally increase the collision hazard for the four federally protected or candidate migratory birds. Cumulative collision mortality effects would be most detrimental to the whooping crane, interior least tern, and piping plover; perches provided by towers and poles could increase the cumulative predation mortality for ground nesting birds, including Sprague's pipit.

Impacts to federally protected and candidate species from the construction and operation of the connected actions (Bakken Marketlink Project, Big Bend to Witten 230-kV Transmission Line, and Electrical Distribution Lines and Substations) would be long term or permanent. The greater sage-grouse, Sprague's pipit, and federally protected species may be impacted by habitat loss resulting from construction of the Bakken Marketlink Project, along with future projects in the area that reduce and fragment preferred habitat for these species. However, habitat loss would be mitigated and any additional potential habitat loss would likely require similar conservation methods and mitigations, thus reducing overall cumulative impacts on these species.

The transmission line, electrical distribution lines, and substations could result in long-term increased bird collisions, bird predation, and habitat loss. However, with implementation of conservation measures, it is not expected that these lines would have cumulative impacts on birds protected under the MBTA or Bald and Golden Eagle Protection Act.

3.3.2.4 Conservation Measures

Conservation measures have been discussed with multiple agencies and would be implemented to avoid, minimize, and compensate for impacts to the Sprague's pipit.

The Final EIS identified several measures to reduce impacts to Sprague's pipit as outlined below:

- Seed disturbance areas in native range with a native seed mix after topsoil replacement.

- Monitor the ROW to determine the success of revegetation after the first growing season, and for areas in which vegetation has not been successfully reestablished, reseed the area.
- Control unauthorized off-road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers or other appropriate trees or shrubs in accordance with landowner or manager request.
- Develop a Migratory Bird Conservation Plan for the proposed Project to comply with the Migratory Bird Treaty Act and implement provisions of Executive Order 13186 by providing benefits to migratory birds and their habitats within the states where the proposed Project would be constructed, operated, and maintained.
- If construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, nest-drag surveys should be completed to determine the presence or absence of nests on federal land in eastern Montana.
- Delay construction activity from April 15 to July 15 within 330 feet of discovered active nests in eastern Montana (MDEQ and MFWP).

3.3.2.5 Determination

Effect on Critical Habitat

The proposed Project would not result in the destruction or adverse modification of federally designated critical habitat for Sprague's pipit as none has been identified for the species.

Effect on the Species

The proposed Project "may affect, but is not likely to adversely affect" Sprague's pipit. This determination is based on Keystone's commitment to follow recommended conservation measures identified by the USFWS, and to implement avoidance and conservation measures. As a result, no direct impacts are expected to result from construction. Indirect impacts from disturbance to Sprague's pipit during proposed Project construction and operation would be disturbance of nesting or mating behavior or from an inadvertent spill.

Although it is possible that a large spill event could result in an adverse effect on this species and its habitat, the probability of adverse effects to Sprague's pipit are unlikely due to the low probability of a spill, low probability of the spill coinciding with important Sprague's pipit habitats, and low probability of a Sprague's pipit contacting the spilled product.

4.0 BACKGROUND

AECOM. 2008a. Personal communication between C. Bessken (USFWS) and P. Lorenz (AECOM). June 11, 2008.

________. 2008b. TransCanada Keystone XL Project - USFWS/MFWP Meeting Notes. Helena, Montana. May 8, 2008.

________. 2008c. TransCanada Keystone XL Project - USFWS/SDGFP Meeting Notes. Lincoln, Nebraska. May 5, 2008.

________. 2008d. TransCanada Keystone XL Project - USFWS/SDGFP Meeting Notes. Pierre, South Dakota. June 10, 2008.

________. 2008e. Personal communication between D. Backlund (SDGFP) and P. Lorenz (AECOM). July 9, 2008.

________. 2009a. TransCanada – Keystone XL Phase II Pipeline Meeting summary. J. Cochnar (USFWS), C. Grell (NGPC), R. Schneider (NGPC), M. Fritz (NGPC), and P. Lorenz (AECOM). February 19, 2009.

________. 2009c. TransCanada – Keystone XL Phase II Pipeline Meeting Summary: Attachment. Summary Report of the Findings for Sensitive Species and Their Associated Habitat During the 2008 Biological Field Surveys Along the Keystone Pipeline Project of the Keystone XL Pipeline Project in Montana. February 5, 2009.

________. 2009d. Personal communication between A. Dood (MFWP) and P. Lorenz (AECOM). March 12 and 13, 2009.

________. 2009e. Personal communication between O. Bocanegra (USFWS) and D. Endriss (AECOM). April 28, 2009.

________. 2009f. TransCanada Keystone XL Project - USFWS/MFWP Meeting Summary. Glasgow, Montana. February 3, 2009.

________. 2009g. Personal communication between L. Hanebury (USFWS) and P. Lorenz (AECOM). April 16, 2009.

APLIC. See Avian Power Line Interaction Committee.

Armbruster, M. J. 1990. Characterization of habitat used by whooping cranes during migration. Biological Report 90(4):1-16.

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collision with Power Lines: The State of the Art in 1994. Edison Electrical Institute. Washington, D.C.

________. 1996. Suggested Practices for Raptor Protection on Power Lines. The State of the Art in 1996. Edison Electric Institute and the Raptor Research Foundation. Washington, D.C.

Atkinson, S.J. and A.R. Dood. 2006. Montana Piping Plover Management Plan. Montana Department of Fish, Wildlife, and Parks. Bozeman, Montana. 78 pp.

Austin, J.E. and A.L. Richert. 2001. A Comprehensive Review of the Observational and Site Evaluation Data of Migrant Whooping Cranes in the United States, 1943-99. U.S.

Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, North Dakota, and State Museum, University of Nebraska, Lincoln, Nebraska. 157 pp. Website: http://www.npwrc.usgs.gov/resource/birds/wcdata/index.htm. (Version 01JUL03). Accessed: December 10, 2012

Backlund, D.C. and G.M. Marrone. 1997. New records of the endangered American burying beetle, *Nicrophorus americanus* Olivier, (Coleoptera: Silphidae) in South Dakota. The Coleopterists Bulletin 51:53-58.

Backlund, D.C., G.M. Marrone, C.K. Williams, and K. Tilmon. 2008. Population estimate of the endangered American burying beetle, *Nicrophorus americanus* Olivier (Coleoptera: Silphidae) in South Dakota. The Coleopterists Bulletin 62:9-15.

Bedick J.C., B.C. Ratcliffe, W.W. Hoback, and L.G. Higley. 1999. Distribution, ecology, and population dynamics of the American burying beetle [*Nicrophorus americanus* Oliver (*Coleoptera*, *Silphidae*)] in south-central Nebraska, USA. Journal of Insect Conservation 3:171-181.

Bedick, J.C., W.W. Hoback, and M.C. Albrecht. 2006. High water-loss rates and rapid dehydration in the burying beetle, *Nicrophorus marginatus*. Physiological Entomology 31: 23-29.

Bent, A.C. 1929. Life Histories of North American Shorebirds (Part II). U.S. National Museum Bulletin 146. Washington, D.C.

Bishop, A.A., W.W. Hoback, M. Albrecht, and K.M. Skinner. 2002. GIS reveals niche partitioning by soil texture among carrion beetles. Transactions in GIS 6: 457-470.

Blickley, J.L., and G.L. Patricelli. 2012. Potential acoustic masking of greater sage-grouse (*Centrocercus urophasianus*) display components by chronic industrial noise. Ornithological Monographs No. 74:23-35.

Blickley, J.L., D. Blackwood, and G.L Patricelli. 2012. Experimental evidence for the effects of chronic anthropogenic noise on abundance of greater sage-grouse at leks. Conservation Biology 26(3):461-471.

Braun, C.E., J.W. Connelly, and M. A. Schroeder. 2001. Seasonal habitat requirements for sage-grouse: spring, summer, fall, and winter. In: Sage-grouse habitat restoration symposium proceedings. June 4-7, 2001, Boise, Idaho. Proc. RMRS-P-38. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 130 pp.

Campbell, L. 2003. Endangered and Threatened Animals of Texas: Their Life History and Management. Website: http://www.tpwd.state.tx.us/huntwild/wild/species/endang/index.phtml. Accessed December 10, 2012.

Canadian Wildlife Service and U.S. Fish and Wildlife Service (CWS and USFWS). 2005. Draft International Recovery Plan for the Whooping Crane. Ottawa: RENEW and USFWS, Albuquerque, New Mexico. 196 pp.

_______. 2007. International recovery plan for the whooping crane. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and USFWS, Albuquerque, New Mexico. 162 pp.

Casey, D. 2000. Partners in Flight Draft Bird Conservation Plan Montana. 281 pp.

Connelly, J.W., and C.E. Braun. 1997. Long-term changes in sage-grouse (*Centrocercus urophasianus)* populations in western North America. Wildlife Biology 3:229-234.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Unpublished report. Western Association of Fish and Wildlife Agencies. Cheyenne, Wyoming.

Cowie, R.H., and D.G. Robinson. 2003. Pathways of introduction of non-indigenous land and freshwater snails and slugs. Pp. 93–122 in Invasive Species: Vectors and Management Strategies. G. M. Ruiz and J. T. Carlton (eds.). Island Press, Washington, DC.

Creighton, J. C., C. C. Vaughn, and B. R. Chapman. 1993. Habitat preference of the endangered American burying beetle (*Nicrophorus americanus*) in Oklahoma. The Southwestern Naturalist 38(3):275-306.

CWS and USFWS. See Canadian Wildlife Service and U.S. Fish and Wildlife Service.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, M.P. Nenneman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Sprague's Pipit. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Online. Website: http://www.npwrc.usgs.gov/resource/literatr/ grasbird/sppi/sppi.htm (Version May 28, 2004). Accessed: December 10, 2012

Doherty, K.E., D.E. Naugle, H.E. Copeland, A. Pocewicz, and J.M. Kiesecker. 2011. Energy development and conservation tradeoffs: systematic planning for greater sage-grouse in their eastern range. In: Greater Sage-Grouse Ecology and Conservation of a Landscape Species and Its Habitat. S.T. Knick and J.W. Connelly Eds. Studies in Avian Biology, A Publication of the Cooper Ornithological Society. University of California Press. 646 pp.

ENSR Corporation (ENSR). 2008. Habitat Assessment for the Federally Endangered American Burying Beetle (*Nicrophorus americanus*) along the Keystone Pipeline Project of the Keystone XL Project Right-of-Way in Nebraska and South Dakota. Document No.: 10623-007. Prepared for Keystone Pipeline Project by ENSR Corporation.

Eggert, A., and S.K. Sakaluk. 2000. Benefits of communal breeding in burying beetles: a field experiment. Ecological Entomology 25: 262-266.

exp Energy Services Inc. 2012. TransCanada Keystone XL Pipeline Project: Environmental Report. September 7, 2012.

Federal Register. 1967. Endangered Species - 1967. Federal Register 32(48):4001.

________. 1970. Conservation of Endangered Species and Other Fish or Wildlife. Federal Register 43(106):8491-8498.

________. 1978. Determination of Critical Habitat for the Whooping Crane. Federal Register 43(94):20938-20942.

________. 1985. Endangered and Threatened Wildlife and Plants; Interior Population of Least Tern to be Endangered. Final Rule. Federal Register 50(102):21784-21792.

________. 1985. Endangered and Threatened Wildlife and Plants; Determination of Endangered and Threatened Status for Piping Plover. Final Rule. Federal Register 50:50726-50734.

________. 1989. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the American Burying Beetle. Final Rule. Federal Register 54(133):29652-29655.

________. 1989. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Eastern and Western Prairie Fringed Orchids. Final Rule. Federal Register 54(187):39857-39863.

________. 1990. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status of Pallid Sturgeon. Final Rule. Federal Register 55(173):36641-36647.

________. 2001. Endangered and Threatened Wildlife and Plants; Final Determinations of Critical Habitat for Wintering Piping Plovers. July 10, 2001. Final Rule. Federal Register 66(132):36038-36086.

________. 2002. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northern Great Plains Breeding Population of the Piping Plover. September 11, 2002. Final Rule. Federal Register 67(176):57638-57717.

________. 2004. Issuance of Permits With Respect to Certain Energy-Related Facilities and Land Transportation Crossings on the International Boundaries of the United States. May 5, 2004. Federal Register 69(87):25299-25301.

________. 2009. Revised Designation of Critical Habitat for the Wintering Population of the Piping Plover (*Charadrius melodus*) in Texas. May 19, 2009. Federal Register 74:23475-23600.

________. 2010a. Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered. March 23, 2010. Federal Register 75(55):13910-14014.

________. 2010b. Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Sprague's Pipit as Endangered or Threatened Throughout Its Range. September 15, 2010. Federal Register 75(178):56028-56050.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. 467 pp.

Fortenbery, D.K. 1972. Characteristics of the Black-Footed Ferret. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Resource Publication 109. 8 pp.

FR. See Federal Register.

Fuller, P.L. 2003. Freshwater aquatic vertebrate introductions in the United States: Patterns and pathways. Pp. 123–151 in Invasive Species: Vectors and Management Strategies. G.M. Ruiz and J.T. Carlton (eds.). Island Press, Washington, DC.

Fuller, D.B., and T.M. Haddix. 2012. Examination of pallid sturgeon use, migrations and spawning in Milk River and Missouri River below Fort Peck Dam during 2011. Report prepared for the U.S. Geological Survey, Columbia Environmental Research Center. Montana Fish, Wildlife and Parks, Fort Peck, MT.

Garton, E.O., J.W. Connelly, J.S. Horne, C.A. Hagen, A. Moser, and M.A. Schroeder. 2011. Greater sage-grouse population dynamics and probability of persistence. In: Greater Sage-Grouse Ecology and Conservation of a Landscape Species and its Habitat. S.T. Knick and J.W. Connelly Eds. Studies in Avian Biology, A Publication of the Cooper Ornithological Society. University of California Press. 646 pp.

Gollop, J.B., T.W. Barry, and E.H. Iversen. 1986. Eskimo curlew a vanishing species? Saskatchewan Natural History Society Special Publication No. 17. Regina, Saskatchewan. Northern Prairie Wildlife Research Center Online. Website: http://www.npwrc.usgs.gov/ resource/birds/curlew/index.htm (Version 16 Jul 1997). Accessed December 10, 2012.

Haig, S.M. 1986. Piping Plover Species Distribution. U.S. Fish and Wildlife Service, Endangered Species Information System Workbook I.

Haig, S.M., and J.H. Plissner. 1993. Distribution and abundance of piping plover: results and implications of the 1991 census. Condor 95:145-156.

Henderson, F.R., P.F. Springer, and R. Adrian. 1969. The Black-Footed Ferret in South Dakota. South Dakota Department of Game, Fish, and Parks. Technical Bulletin No. 4:137.

Hillman, C.N. 1968. Life History and Ecology of the Black-Footed Ferret. M.S. Thesis. South Dakota State University, Brookings, South Dakota. 28 pp.

Hillman, C.N., and J.W. Carpenter. 1980. Breeding Biology and Behavior of Captive Black-Footed Ferrets. International Zoo Yearbook 23:186191.

Hinton, H.E. 1981. Biology of insect eggs. Oxford: Pergammon. 1113 pp.

Hoback, W. 2010. American Burying Beetle Habitat Assessment Model and Field Survey Results for Nebraska and Texas along the Keystone XL Pipeline Project and Habitat Assessment for South Dakota. August 2010. Prepared for Keystone Pipeline Project.

________. 2012. Hoback August Survey Report. Results of Survey for American Burying Beetle, *Nicrophorus americanus*, in Northern Keya Paha, Western Boyd, Eastern Holt, and Antelope Counties.

Hornaday, W.T. 1916. Save the sage-grouse from extinction, a demand from civilization to the western states. New York Zoological Park Bulletin 5:179-219.

Howe, M.A. 1987. Habitat Use by Migrating Whooping Cranes in the Aransas-Wood Buffalo Corridor, pages 303-311. In: J.C. Lewis and J. W. Ziewitz, eds. Proc. 1985 Crane Workshop. Platte River Whooping Crane Habitat Maintenance Trust and USFWS, Grand Island, Nebraska.

Johns, B.W., E.J. Woodsworth, and E.A. Driver. 1997. Habitat Use by Migrant Whooping Cranes in Saskatchewan. Proceedings North American Crane Workshop 7:123-131.

Johnsgard, P.A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the Northern Rocky Mountain region. Colorado Associated University Press, Boulder. xi + 504 pp.

Johnson, D.H., M.J. Holloran, J.W. Connelly, S.E. Hanser, C.L. Amundson, and S.T. Knick. 2011. Influences of environmental and anthropogenic features on greater sage-grouse populations, 1997-2007. In: Greater Sage-Grouse Ecology and Conservation of a

Landscape Species and It Habitat. S.T. Knick and J.W. Connelly Eds. Studies in Avian Biology, A Publication of the Cooper Ornithological Society. University of California Press. 646 pp.

Jones, S.L. 2010. Sprague's Pipit (*Anthus spragueii*) conservation plan. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C. Available online at: http://www.fws.gov/mountain-prairie/species/birds/spraguespipit/index.html. Accessed December 10, 2012.

Jurzenski, J., and W.W. Hoback. 2010. Updated distribution of American burying beetle in Nebraska and predictive model of its occurrence. Prepared for USFWS.

Jurzenski, J., D.G. Snethen, M.L. Brust, and W.W. Hoback. 2011. New records of carrion beetles in Nebraska reveal increased presence of the American burying beetle, *Nicrophorus americanus* Oliver (Coleoptera: Silphicae). Great Plains Research 21: 131-143.

Jurzenski, J. 2012. Factors Affecting the Distribution and Survival of Endangered American Burying Beetles, *Nicrophorus americanus* Olivier. Ph.D. Dissertation, University of Nebraska-Lincoln, Nebraska.

Linder, R.L., R.B. Dahlgren, and C.N. Hillman. 1972. Black-Footed Ferret Prairie Dog Interrelationships. Reprint from Symposium on Rare and Endangered Wildlife of the Southwestern United States. Albuquerque, New Mexico. New Mexico Department of Game and Fish, Santa Fe, New Mexico. 37 pp.

Lingle, G.R. 1987. Status of Whooping Crane Migration Habitat within the Great Plains of North America, pages 331-340. In: J.C. Lewis and J. Zewitz, eds. Proc. 1985. Crane Workshop. Platte River Whooping Crane Habitat Maintenance Trust and USFWS, Grand Island, Nebraska.

Lingle, G.R., G.A. Wingfield, and J.W. Ziewitz. 1991. The Migration Ecology of Whooping Cranes in Nebraska, U.S.A. pages 395-401. In: J. Harris, ed. Proc. 1987 International Crane Workshop, International Crane Foundation, Baraboo, Wisconsin.

MFWP. See Montana Fish, Wildlife & Parks.

Milne L.J. and M.J. Milne. 1976. The social behavior of burying beetles. Scientific American 235:84-89.

Minnesota Department of Natural Resources. 2007. Western Prairie Fringed Orchid: A Threatened Midwestern Prairie Plant. Minnesota Department of Natural Resources. Website: http://www.dnr.state.mn.us/eco/prairies.html. Accessed December 10, 2012.

MNHP. See Montana Natural Heritage Program.

Montana Audubon. 2012. Important Bird Areas. Helena, Montana. Available online at: http://mt audubon. org/birds/areas.html. Accessed August 29, 2012.

Montana Field Guide. 2012a. Greater sage-grouse species account. Website: http://fieldguide.mt. gov/ detail_ABNLC12010.aspx. Accessed August 28, 2012.

________. 2012b. Sprague's pipit species account. Website: http://fieldguide.mt.gov/ detail_AB NLC12010.aspx . Accessed August 28, 2012.

Montana Natural Heritage Program. 2008. Email response to data request from M. Miller (MNHP) to P. Lorenz (AECOM). July 1, 2008.

Montana Natural Heritage Program and Montana Fish, Wildlife and Parks (MNHP and MFWP). 2012. Sprague's Pipit — Anthus spragueii. Montana Field Guide. http://fieldguide.mt.gov/detail_ABNLC12010.aspx . Accessed on October 31, 2012.

Montana Sage Grouse Work Group. 2005. Management Plan and Conservation Strategies for Sage Grouse in Montana – Final. Montana Sage Grouse Work Group.

Murphy, R.K., S.M. McPherron, G.D. Wright, and K.L. Serbousek. 2009. Effectiveness of avian collision averters in preventing migratory bird mortality from powerline strikes in the central Platte River, Nebraska 2008-2009 Final Report. Department of Biology, University of Nebraska-Kearney, Kearney, NE 68849. 34 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Website: http://www.natureserve.org/ explorer. Accessed December 10, 2012.

Nelson, D.L. 1998. Least Tern. In: Colorado Breeding Bird Atlas. H.E. Kingery ed. Published by Colorado Bird Atlas Partnership; co-published by Colorado Division of Wildlife, pages 192-193.

Oklahoma State University. 1993. Oklahoma's Endangered and Threatened Species. Forestry Extension Report #6. Oklahoma Cooperative Extension Service, Division of Agricultural Sciences and Natural Resources, Oklahoma State University. 43 pp

Peterson, R.T. 1980. A Field Guide to the Birds of Eastern and Central North America. Fourth Edition. Houghton Mifflin Company. Boston, MA.

Phillips, L. 2003. Pollination of Western Prairie Fringed Orchid, *Platanthera praeclara*: Implications for Restoration and Management. Restoration and Reclamation Review Student On-Line Journal (Hort 5015/5071). University of Minnesota, St. Paul, Minnesota (USA) Department of Horticultural Science. Website: http://purl.umn.edu/60217. Accessed: December 10, 2012.

PHMSA. See Pipeline and Hazardous Materials Safety Administration.

Pukowski, E. 1933. Ökoloische untersuchungen an Necrophorus F.Z. Morphol. Ökol. Tiere 27:518-586.

Ratcliffe B. 1996. The carrion beetles (Coleoptera: Silphidae) of Nebraska. Bulletin of the University of Nebraska State Museum 13:1-100.

Schnell, G.D., A.E. Hiott, J.C. Creighton, V.L. Smyth, and A. Komendat. 2008. Factors affecting overwinter survival of the American burying beetle, *Nicrophorus americanus* (Coleoptera: Silphidae). Journal of Insect Conservation 12:483-492.

Scott, M.P. 1998. The ecology and behavior of burying beetles. Annual Review of Entomology 43: 595-618.

SDGFP. See South Dakota Department of Game, Fish, and Parks.

Sheviak, C.J., and M.L. Bowles. 1986. The prairie fringed orchids: a pollinator-isolated species pair. Rhodora 88:267-290.

Sieg, C.H., and A.J. Bjugstad. 1994. Five years of following the western prairie fringed orchid (*Platanthera praeclara*) on the Sheyenne National Grassland, North Dakota. In: Wickett, R.G., P.D. Lewis, A. Woodliffe, and P. Pratt, eds. Spirit of the land, our prairie legacy. Proceedings of the Thirteenth North American Prairie Conference; 1992 August 6-9, Windsor, Ontario, Canada. Windsor, Ontario, Canada: Department of Parks and Recreation, pages 141-146.

Sieg, C.H., and R.M. King. 1995. Influence of Environmental Factors and Preliminary Demographic Analyses of a Threatened Orchid, *Platanthera praeclara*. American Midland Naturalist 134:307-323.

Sieg, C.H. 1997. The mysteries of a prairie orchid. Endangered Species Bulletin, XXII(4): 12-13.

Sieg, C.H., and P.M. Wolken. 1999. Dynamics of a threatened orchid in flooded wetlands. In: Springer, J.T. ed. The central Nebraska loess hills prairie: Proceedings of the sixteenth North American Prairie Conference, 16:193-201.

South Dakota Department of Game, Fish, and Parks (SDGFP). 2008. Email response (two emails) to data request from D. Backlund (SDGFP) to P. Lorenz (AECOM). South Dakota Natural Heritage Program. July 9, 2008.

Stubbendieck, J., and S.J. Tunnell. 2008. Seventy-eight Years of Vegetation Dynamics in a Sandhills Grassland. Natural Area Journal 28(1): 58-65.

Swenk, M.H. 1926. The Eskimo Curlew in Nebraska. Wilson Bulletin 38: 117-118.

The Wildlife News. 2012. Yet Another Yellowstone Wolf Disperses to South Dakota. Website: http://www.thewildlifenews.com/2012/05/16/yet-another-yellowstone-wolf-disperses-to-south-dakota/. Accessed August 28, 2012.

U.S. Bureau of Land Management (BLM). 2011. Instruction Memorandum No. 2012-043: Greater Sage-Grouse Interim Management Policies and Procedures. U.S. Bureau of Land Management, Washington, D.C.

U.S. Department of State (Department). 2011. Final Environmental Impact Statement Keystone XL Project.

U.S. Department of State (Department). 2012. Supplemental Environmental Impact Statement Keystone XL Project.

U.S. Fish and Wildlife Service (USFWS). 1987. Atlantic coast piping plover recovery plan. USFWS, Newton Corner, Massachusetts. 245 pp.

________. 1988a. Black-Footed Ferret Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 154 pp.

________. 1988b. Recovery plan for piping plover breeding in the Great Lakes and Northern Great Plains. U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 160 pp.

________. 1989. Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, Colorado, and Albuquerque, New Mexico. April 1989. 10 pp.

________. 1990. Recovery Plan for the Interior Least Tern (*Sterna antillarum*). U.S. Fish and Wildlife Service. Twin Cities, Minnesota. 90 pp.

________. 1991. American Burying Beetle (*Nicrophorus americanus*) Recovery Plan. Newton Corner, Massachusetts. 80 pp.

________. 1993. Recovery plan for the pallid sturgeon (*Scaphirhynchus albus*). U.S. Fish and Wildlife Service, Denver, Colorado. 55 pp.

________. 1994. Draft revised recovery plan for piping plover, *Charadrius melodus*, breeding in the Great Lakes and Northern Great Plains of the United States. June 28, 1994. U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 85 pp. + appendices.

________. 1996. Western Prairie Fringed Orchid Recovery Plan (*Platanthera praeclara*). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. Vi + 101 pp.

________. 2003. Status of Gray Wolf Recovery, Weeds 3/28 to 4/04, 2003. Website: http://www.fws.gov/mountain-prairie/species/mammals/wolf/WeeklyRpt03/wk0404 2003.htm. Accessed August 28, 2012.

________. 2005. Pallid sturgeon (*Scaphirhynchus albus*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Billings, Montana.

________. 2007. Western Prairie Fringed Orchid *Platanthera praeclara*. U.S. Fish and Wildlife Service, Mountain-Prairie Region, South Dakota Ecological Services Field Office. Website: http://www.fws.gov/southdakotafieldoffice/ORCHID.HTM. Accessed December 10, 2012.

________. 2008a. Endangered, Threatened, Proposed, and Candidate Species, Kansas Counties, December 2008. U.S. Fish and Wildlife Service, Ecological Services, Kansas Field Office. Website: http://www.fws.gov/mountain-prairie/endspp/countylists/kansas.pdf. Accessed December 10, 2012.

________. 2008b. Black-Footed Ferret (*Mustela nigripes*) 5-Year Status Review: Summary and Evaluation. U.S. Fish and Wildlife Service, South Dakota Field Office, Pierre, South Dakota. 38 pp.

________. 2008c. Meeting notes. Fish, Wildlife, and Sensitive species potentially occurring along the Project route in Nebraska. Correspondence between J. Cochnar (USFWS, Nebraska Ecological Services Field Office) and P. Lorenz (ENSR). May 5, 2008.

________. 2008d. Meeting Notes. Fish, wildlife and sensitive species potentially occurring along the Project route in Montana. Correspondence between L. Hanebury (USFWS) and P. Lorenz, C. Barnes (ENSR). May 8, 2008.

________. 2008e. Letter. U.S. Fish and Wildlife Service, Ecological Services, Nebraska Field Office. October 8, 2008.

______. 2008f. American burying beetle (*Nicrophorus americanus*). 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Concord, New Hampshire. 53 pp.

________. 2009a. Whooping cranes and wind development – an issue paper. U.S. Fish and Wildlife Service, Regions 2 and 6. 27 pp.

________. 2009b. Website: http://www.fws.gov/midwest/endangered/plants/index.html#west orchid. Accessed December 10, 2012.

________. 2010. Region 6 Guidance for Minimizing Effects from Power Line projects within the Whooping Crane Migration Corridor. February 4, 2010. Assistant Regional Director, Ecological Services, Region 6, Mountain Prairie Region, Denver, Colorado.

________. 2011. Personal Communication. Martha Tacha, U.S. Fish and Wildlife Service, Grand Island, and John Carlson, Bureau of Land Management, Glasgow, Montana. January 6, 2011.

________. 2012a. Gray wolf status in South Dakota. South Dakota Field Office. Website: http://www.fws.gov/southdakotafieldoffice/WOLF.HTM. Accessed August 28, 2012.

________. 2012b. Technical Assistance Letter for the TransCanada Keystone XL Pipeline, Nebraska Ecological Services Field Office, Grand Island, Nebraska.

________. 2012c. Endangered species description for greater sage-grouse. Website: http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/. Accessed on August 28, 2012.

U.S. Fish and Wildlife Service and Nebraska Game and Parks Commission (USFWS and NGPC). 2008. Nebraska American Burying Beetle Trapping Protocol. Grand Island, Nebraska and Lincoln, Nebraska.

U.S. Geologic Service (USGS). 2006. North Dakota's Endangered and Threatened Species Western Prairie Fringed Orchid *Platanthera praeclara*. USGS Northern Prairie Wildlife Research Center. Website: http://www.npwrc.usgs.gov/resource/wildlife/endanger/plat prae.htm. Accessed December 10, 2012.

USFWS. See U.S. Fish and Wildlife Service.

USFWS and NGPC. See U.S. Fish and Wildlife Service and Nebraska Game and Parks Commission.

USGS. See U.S. Geologic Service.

Wallestad, R. 1975. Life history and habitat requirements of sage-grouse in central Montana. Montana Department of Fish and Game, Helena, Montana.

Wiens, T.P. 1986. Nest-site tenacity and mate retention in the piping plover. M.S. Thesis. University of Minnesota, Duluth. 34 pp.

Wilson, D.S., and J. Fudge. 1984. Burying beetles: intraspecific interactions and reproductive success in the field. Ecological Entomology 9:195-203.

Wilson, R. 2004. Pallid sturgeon recovery update. Issue No.14:1-25. Website: http://www.fws.gov/ moriver/Pallid%20Sturgeon%20Activities.htm.

Wright, G.D., T.J. Smith, R.K. Murphy, J.T. Runge, and R.R. Harms. 2009. Mortality of cranes (Gruidae) associated with powerlines over a major roost on the Platte River, Nebraska. The Prairie Naturalist 41(3/4):116-120.

BIOLOGICAL ASSESSMENT APPENDICES IN THE SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

To reduce duplication in the Supplemental Environmental Impact Statement, some of the Biological Assessment appendices are not attached. Others are not attached because they contain confidential or sensitive information and were only included in agency submittals. The following table lists the location of the appendices for the Supplemental EIS publication.

	Biological Assessment Appendix	**Provided at**
A	Letters of Section 7 Consultation Commitments from Power Providers	BA Appendix A
B	Construction, Mitigation, and Reclamation Plan (CMRP)	SEIS Appendix G
C	PHMSA 57 Special Conditions for Keystone XL and Keystone Compared to 49 CFR 195	SEIS Appendix B
D	Spill Prevention, Control, and Countermeasures (SPCC) Plan and Emergency Response Plan (ERP)	SEIS Appendix I
E	Past, Present, and Reasonably Foreseeable Future Project Descriptions	SEIS Appendix V
F	Pipeline Temperature Effects Study	SEIS Appendix S
G	Pipeline Risk Assessment and Environmental Consequence Analysis	SEIS Appendix Q
H	CONFIDENTIAL - NOT UNITED STATES GOVERNMENT (USG) CLASSIFIED A Summary Report of the July 2008 Piping Plover (*Charadrius melodus*) and Least Tern (*Sterna antilarum*) Surveys for the Steele City Segment of the Keystone XL Project	No
I	CONFIDENTIAL - NOT USG CLASSIFIED Summary of 2011 Federally-Listed Species Searches for the Keystone XL Pipeline Project Steele City Segment (including the Western Prairie Fringed Orchid, Interior Least Tern, and Piping Plover)	No
J	CONFIDENTIAL - NOT USG CLASSIFIED Summary of 2012 Special Status Species Searches for the Keystone XL Pipeline Project Nebraska Reroute (including the Western Prairie Fringed Orchid, Interior Least Tern, and Piping Plover)	No
K	Supporting Meeting Summaries, Consultation Letters, and Communications	No
L	CONFIDENTIAL - NOT USG CLASSIFIED Summary of April 2010 Aerial Searches for Greater Sage-grouse Leks, Keystone XL Pipeline Project Steele City Segment	No
M	CONFIDENTIAL - NOT USG CLASSIFIED Summary of April 2011 Aerial Searches for Greater Sage-grouse Leks, Keystone XL Pipeline Project Steele City Segment	No
N	CONFIDENTIAL - NOT USG CLASSIFIED Summary of April 2012 Aerial Searches for Greater Sage-grouse Leks and Sharptailed Grouse Leks, Keystone XL Pipeline Project Steele City Segment (Montana and South Dakota)	No
O	CONFIDENTIAL - NOT USG CLASSIFIED An Approach for Implementing Mitigation Measures to Minimize the Effects of Construction and Operation of the Keystone XL Pipeline Project on Greater Sage-Grouse	No
P	CONFIDENTIAL - NOT USG CLASSIFIED An Approach for Implementing Mitigation Measures to Minimize the Effects of Construction and Operation of the Keystone XL Pipeline Project on Greater Sage-Grouse in South Dakota; and Associated Correspondence	No

	Biological Assessment Appendix	Provided at
Q	CONFIDENTIAL - August 2010 American Burying Beetle Habitat Assessment Model and Field Survey Results for Nebraska and Texas along the Keystone XL Pipeline Project and Habitat Assessment for South Dakota	No
R	CONFIDENTIAL - NOT USG CLASSIFIED Field Survey for Western Prairie Fringed Orchid (*Platenthera praeclara*) and the Small White Lady's-Slipper (*Cypripedium candidum*) along the Keystone XL Project in South Dakota and Nebraska	No

APPENDIX H

2012 Biological Assessment

Appendix A

Letters of Section 7 Consultation Commitments from Power Providers

-Page intentionally left blank-

PEC
PEOPLE'S ELECTRIC COOPERATIVE

P.O. Box 429
Ada, OK 74821-0429
(580) 332-3031

September 8, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

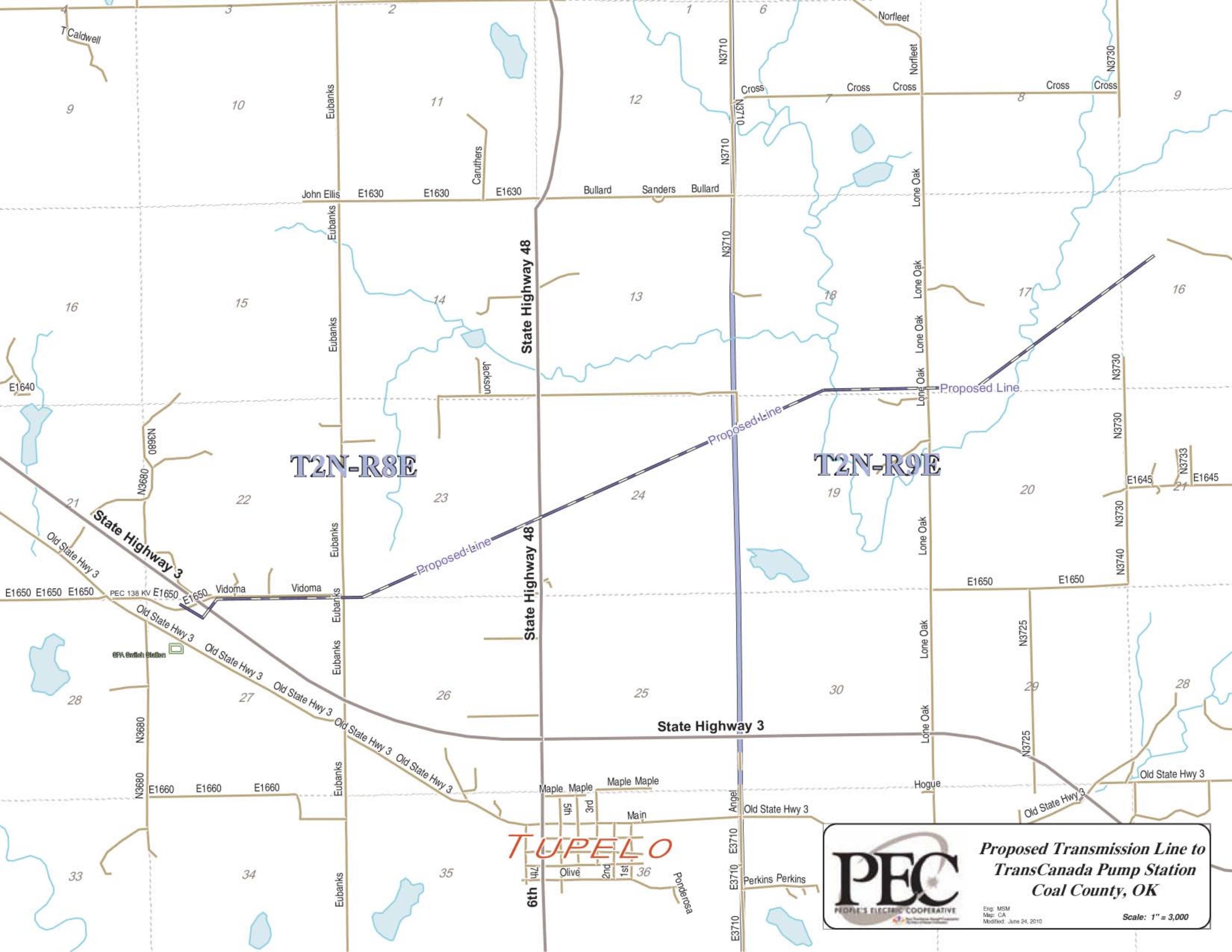
People's Electric Cooperative a power provider located in southeastern Oklahoma, is providing electric service to Pump Station #34 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

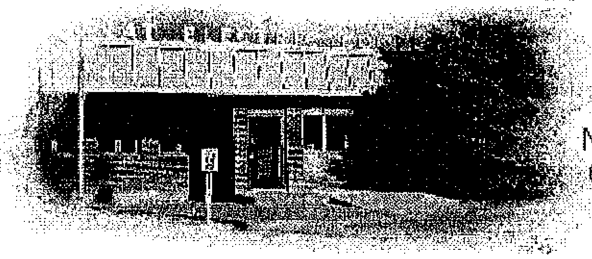
Sincerely,

John W. Hudson
Senior Vice President
Operations and Engineering



Proposed Transmission Line to TransCanada Pump Station Coal County, OK
PEC
PEOPLE'S ELECTRIC COOPERATIVE
Eng: MSM
Map: CA
Modified: June 24, 2010
Scale: 1" = 3,000
T2N-R8E
T2N-R9E
TUPELO
State Highway 48
State Highway 3
Old State Hwy 3
Proposed Line
PEC 138 KV
SPA Switch Station
Eubanks
John Ellis
E1630
Bullard
Sanders
Caruthers
Cross
Norfleet
N3710
N3730
N3680
N3725
N3733
N3740
Lone Oak
Jackson
Vidoma
E1650
E1640
E1645
E1660
T Caldwell
Maple
Main
Olive
Hogue
Angel
E3710
Perkins
Ponderosa
5th
3rd
7th
2nd
1st
6th

Big Flat Electric Cooperative, Inc.



PO Box 229
333 S 7th St E
Malta, MT 59538
(406) 654-2040

Serving Blaine, Phillips, & Valley Counties

September 9, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

Big Flat Electric Co-op., Inc, a power provider located in Malta, Montana, is providing electric service to Pump Station #9 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Sincerely,

Jeanne Barnard
Jeanne Barnard
Manager, Big Flat Electric Co-op., Inc.

-This page intentionally left blank-

ROSEBUD ELECTRIC
COOPERATIVE, INCORPORATED

P.O. Box 439
512 Rosebud Avenue
Gregory, SD 57533
Phone: 605-835-9624
Toll Free: 1-888-464-9304
Fax: 605-835-9649
Email: rosebudelectric.com

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

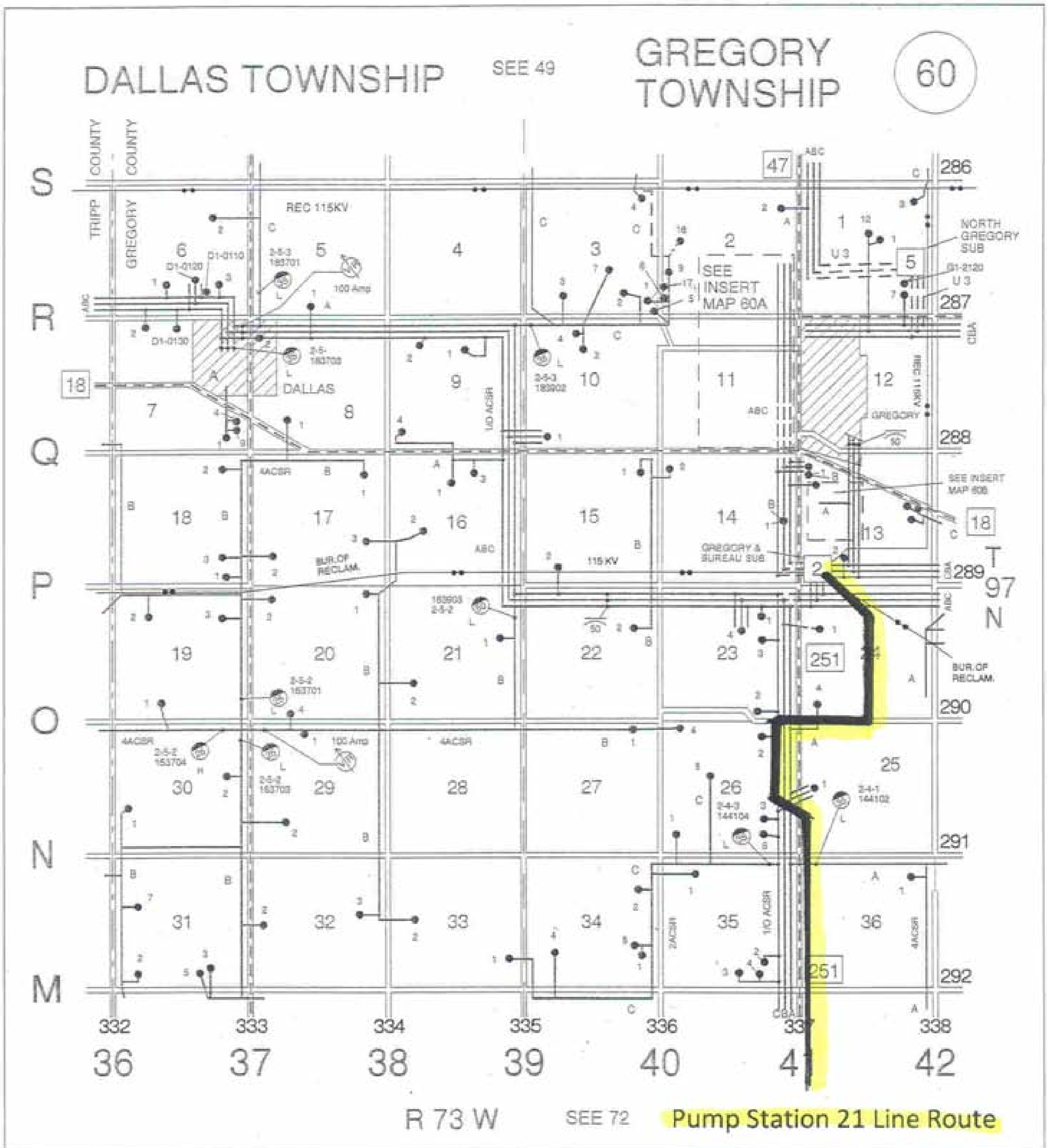
Rosebud Electric, a power provider located in Gregory SD, is providing electric service to Pump Station 20 and 21 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

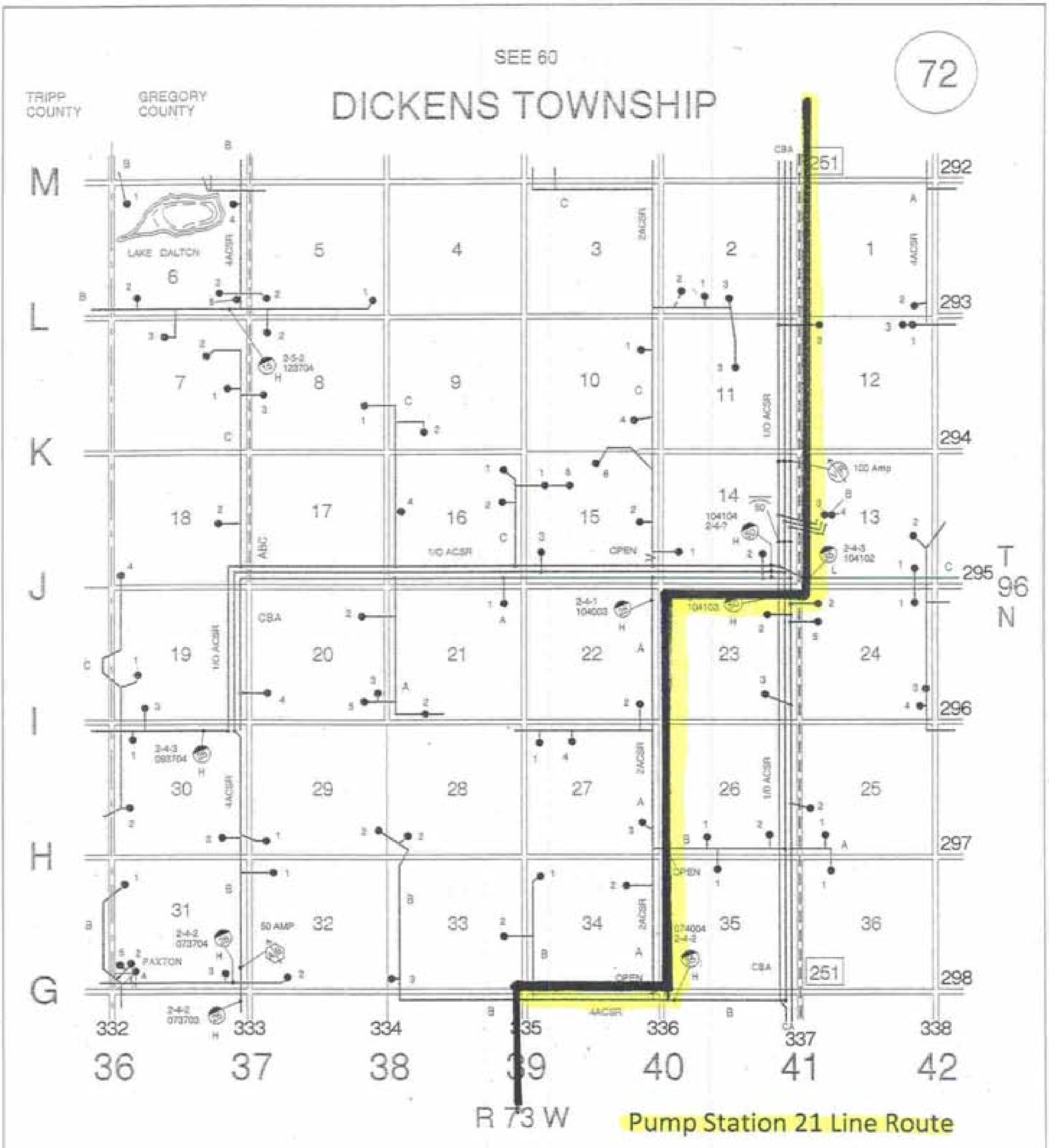
Enclosed are proposed maps ofthe power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Sincerely,

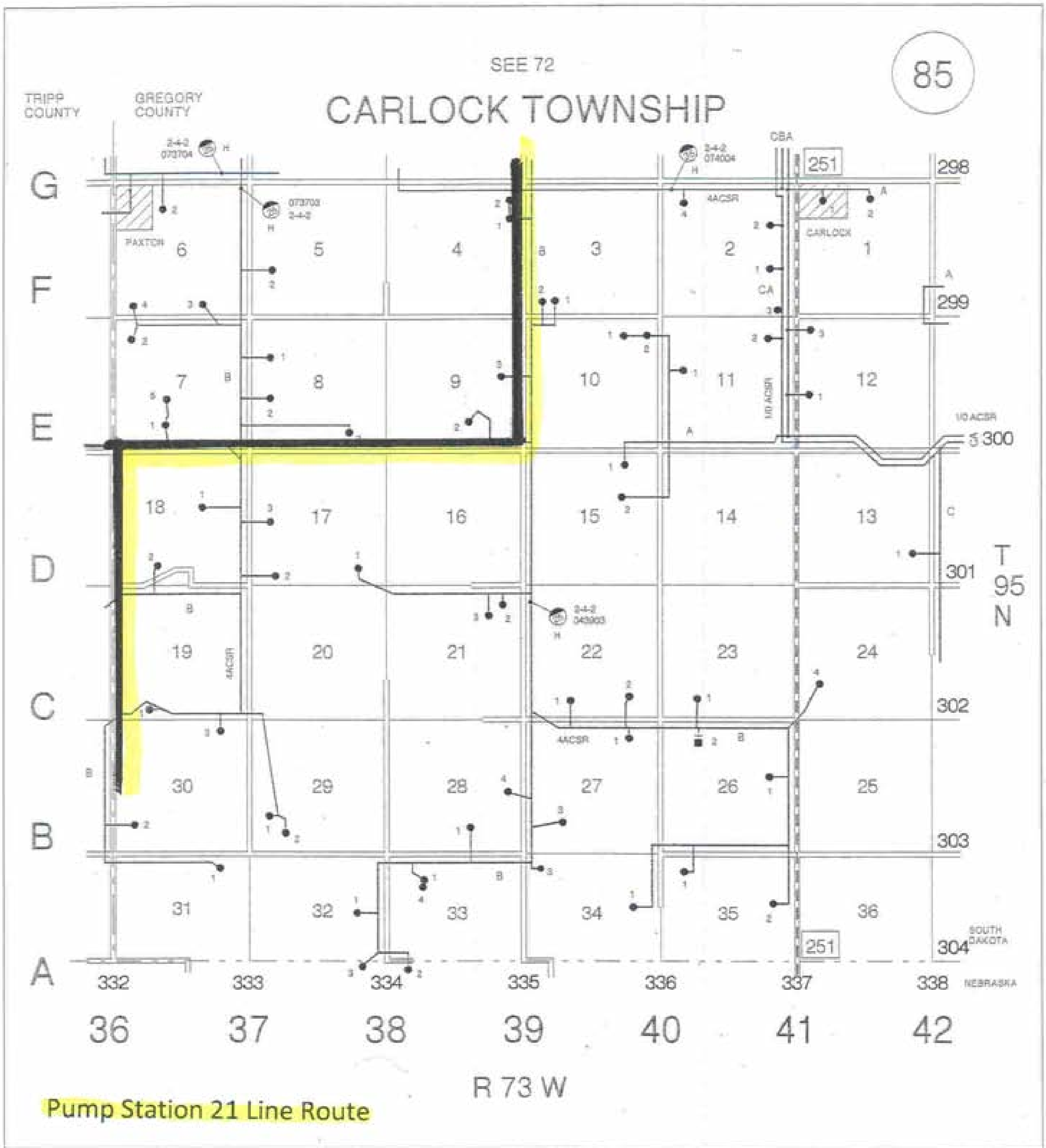
Gary Clayton, Manager Rosebud Electric Cooperative Inc.



Rosebud Electric Cooperative   Gregory, SD 1 Inch = 1 Mile

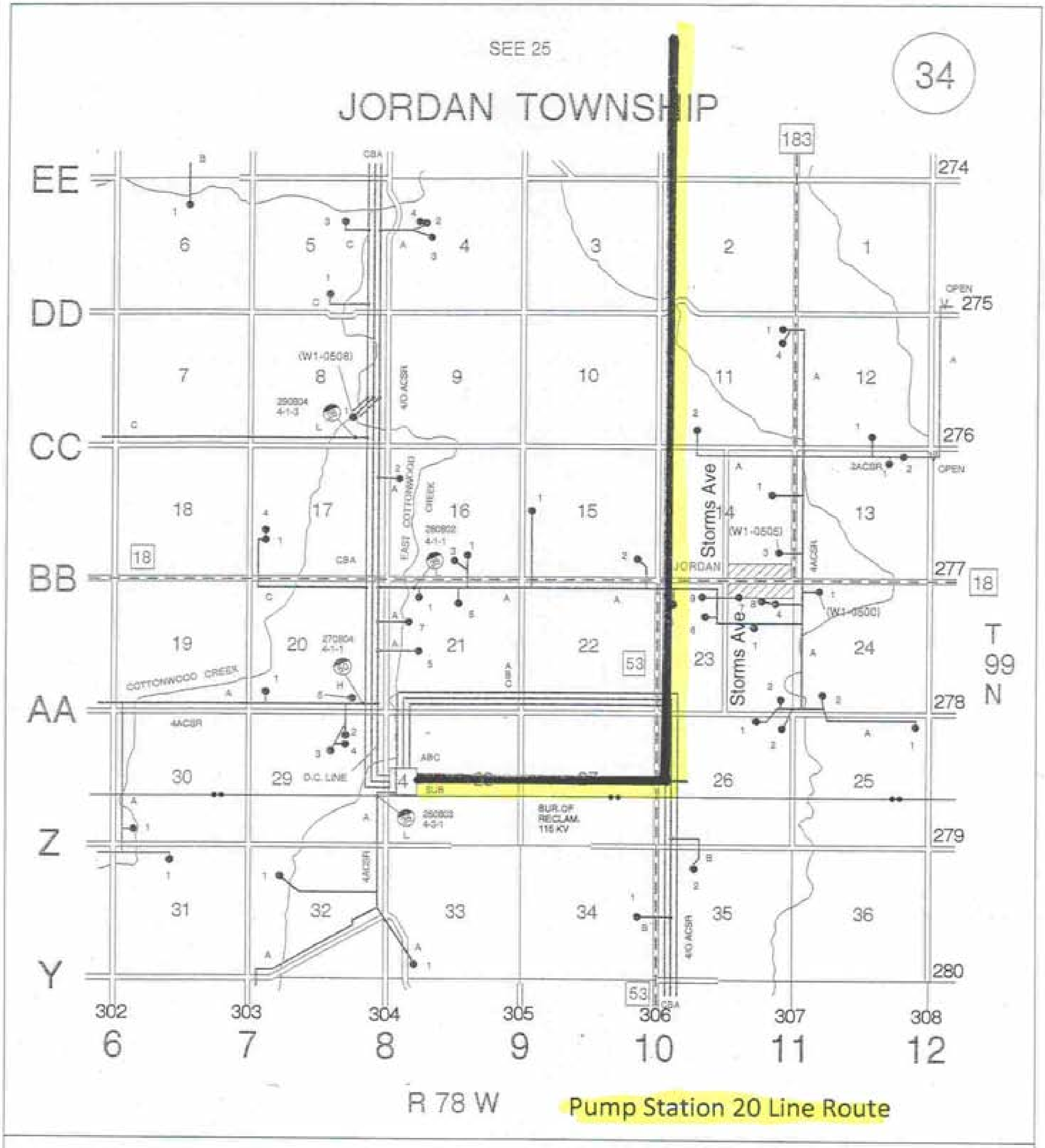


Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile



Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile

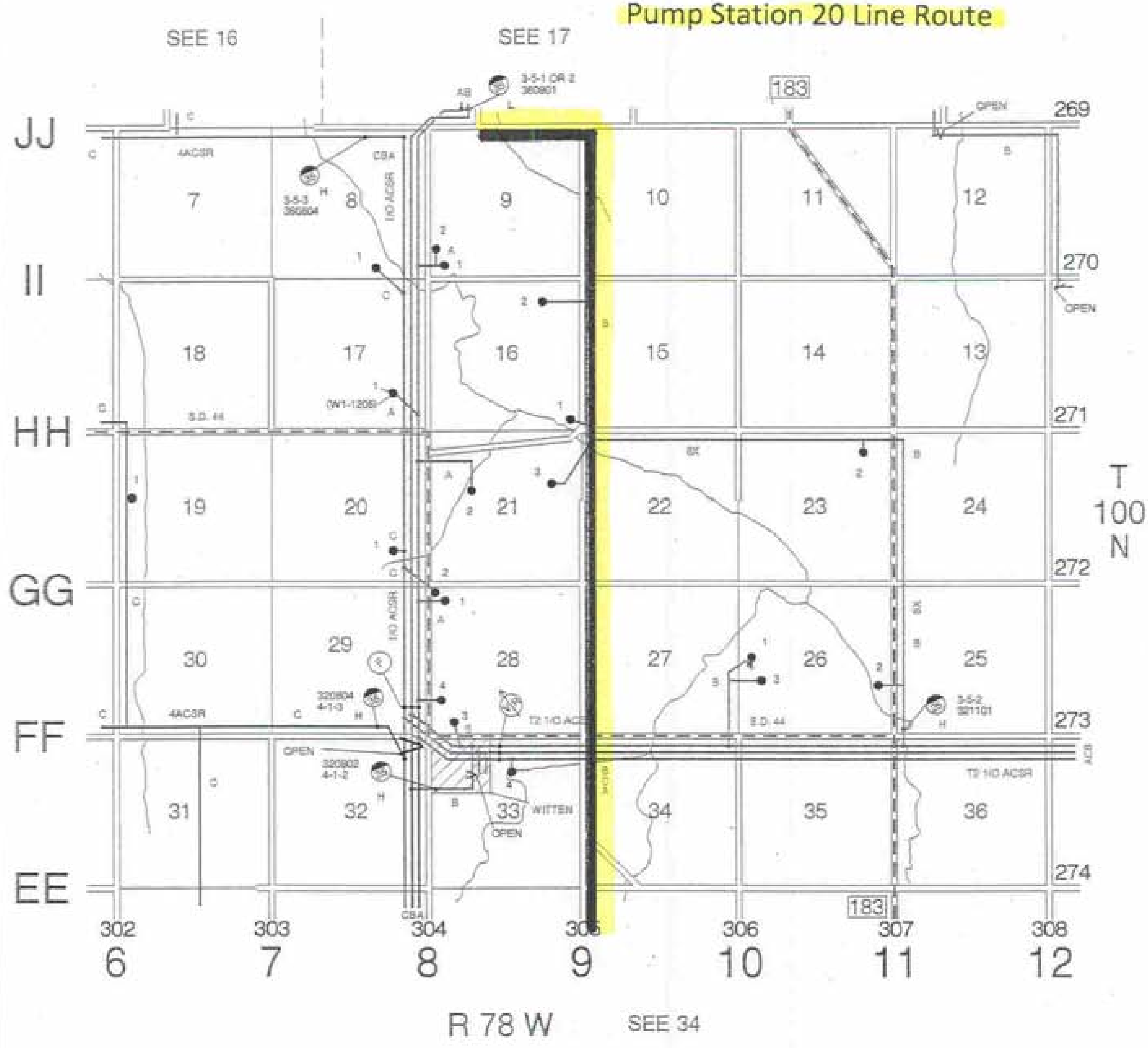
Pump Station 20 Line Route



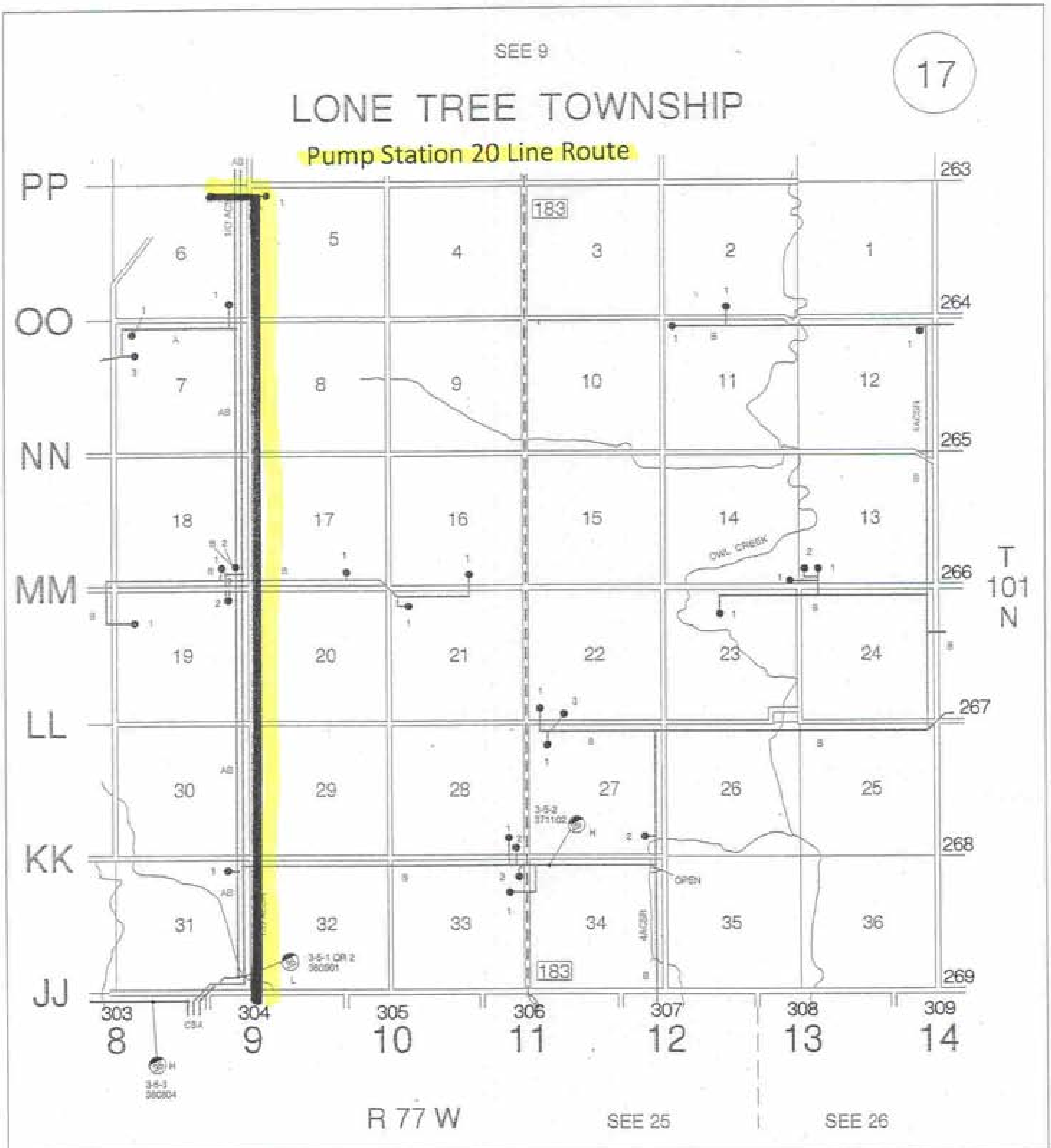
Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile

WITTEN TOWNSHIP

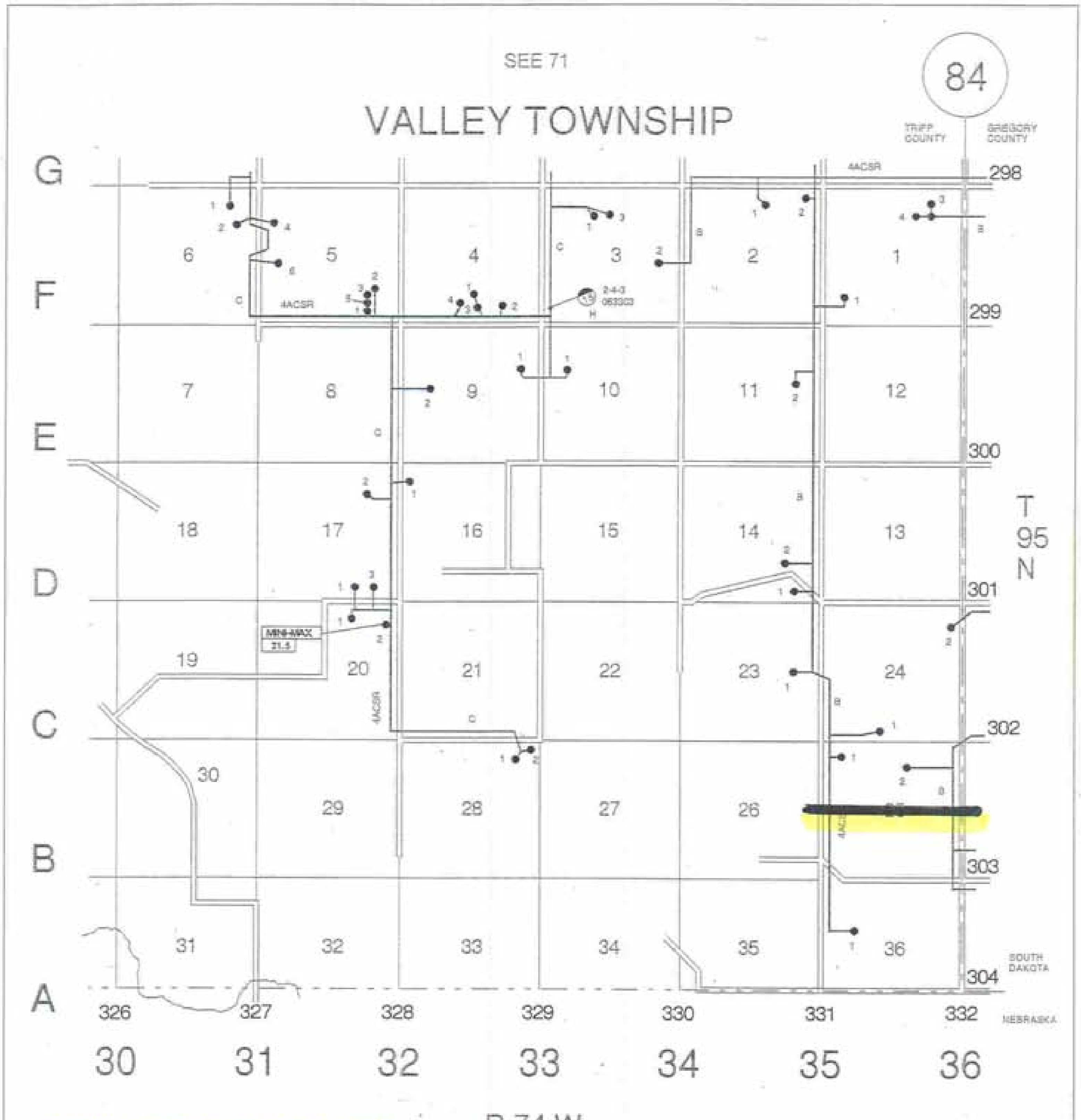
25



Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile



Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile



Pump Station 21 Line Route

Rosebud Electric Cooperative Gregory, SD 1 Inch = 1 Mile

NorVal Electric Cooperative, Inc.

P.O. Box 951
Glasgow, MT 59230
Phone (406) 228-9351
Fax (406) 367-9306

P.O. Box 287
Opheim, MT 59250
Phone (406) 762-3411
Fax (406) 762-3352

September 13, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

NorVal Electric Cooperative, Inc., a power provider located in Glasgow, MT, is providing electric service to Pump Stations 10 and 11 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Sincerely,

Craig Herbert

Craig Herbert
General Manager
NorVal Electric Cooperative, Inc

POINT OF INTERCONNECTION AND COOPERATIVE INTERCONNECTION FACILITIES

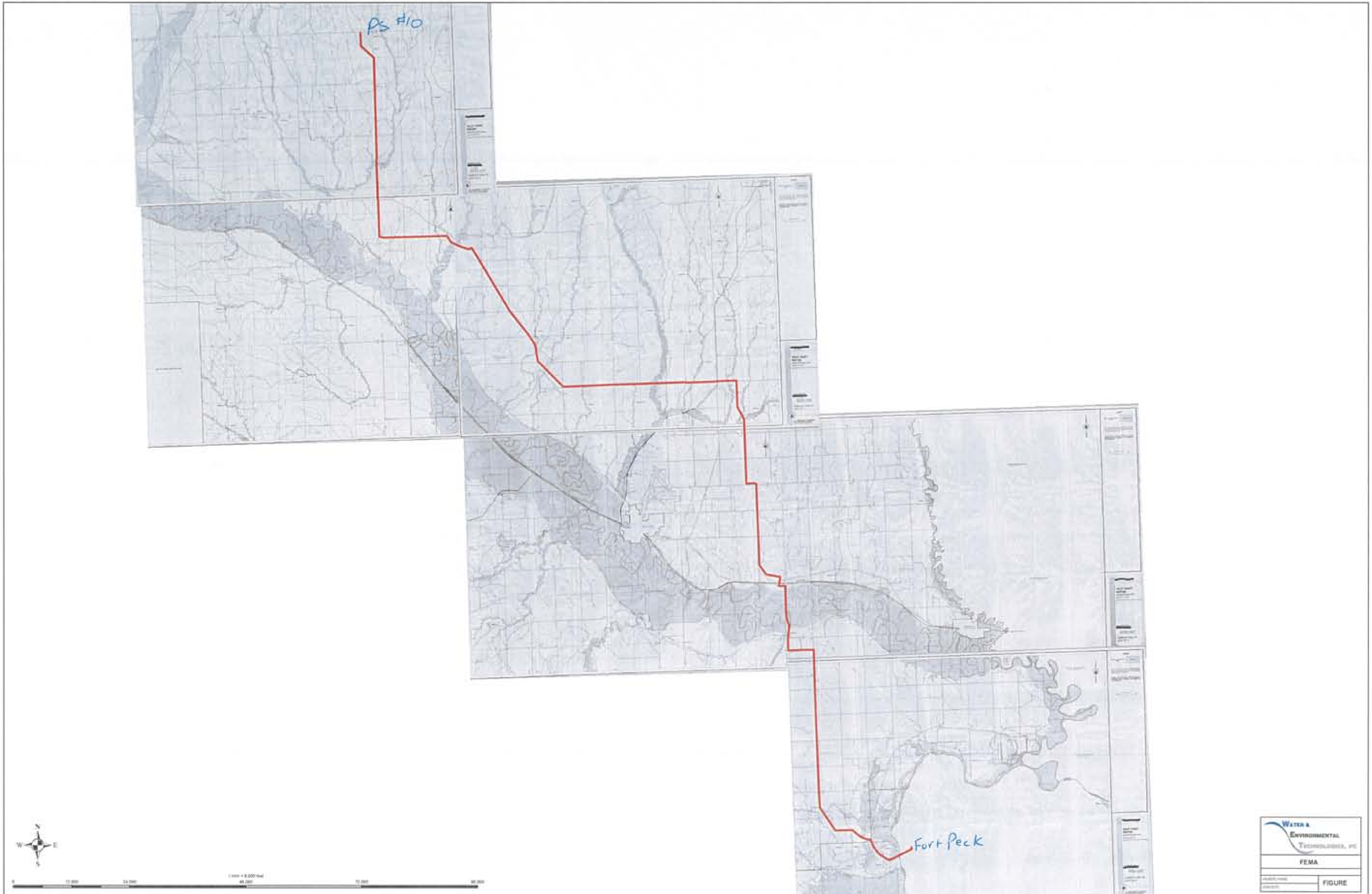
Point of Interconnection:

The Point of Interconnection between the NorVal and TransCanada Electrical Facilities at Pump Station #10 shall be at the 115/6.9 kilovolt substation, herein referred to as the Black Coulee Substation. An air break switch (ABS) on the 6.9 kV bus shall be established as the demark point between the two entities.

NorVal shall construct 51.0 miles of 115 kilovolt transmission line from the Fort Peck substation to the pump location (PS #10) located in Section 01, Township 31N, Range 37E.

The NorVal Coal Hill 230Kv / 6.9 kV substation, located at or near Customer pump station #11, and all associated substation electrical equipment required under RUS specifications and approved engineering design standards.

The NorVal 230Kv substation interconnecting the Western Area Power Administration 230 Kv line from Fort Peck to Glendive Montana. This shall be near the Customer's pump station #11 located in Township 25 North, Range 42 East, Section 01.



Ps #10
Fort Peck
N
W
E
S
0
12,000
24,000
48,000
72,000
96,000
Water &
Environmental
Technologies, PC
FEMA
FIGURE

-This page intentionally left blank-

"Engineering with Distinction"
ECI
ELECTRICAL CONSULTANTS, INC.
BILLINGS OFFICE: 3521 GABEL ROAD, BILLINGS, MONTANA 59102 • PHONE: 406-259-9933 • FAX: 406-259-3441

September 17, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

Tongue River Electric Cooperative, Inc, a power provider located in Ashland, MT is providing electric service to Pump Station 13 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Please feel free to contact me at 406-784-2341 with any questions or comments you may have. My address is also shown below:

Tongue River Electric Cooperative
PO Box 138
Ashland, MT 59003

Sincerely,

Alan See, General Manager
Tongue River Electric Cooperative

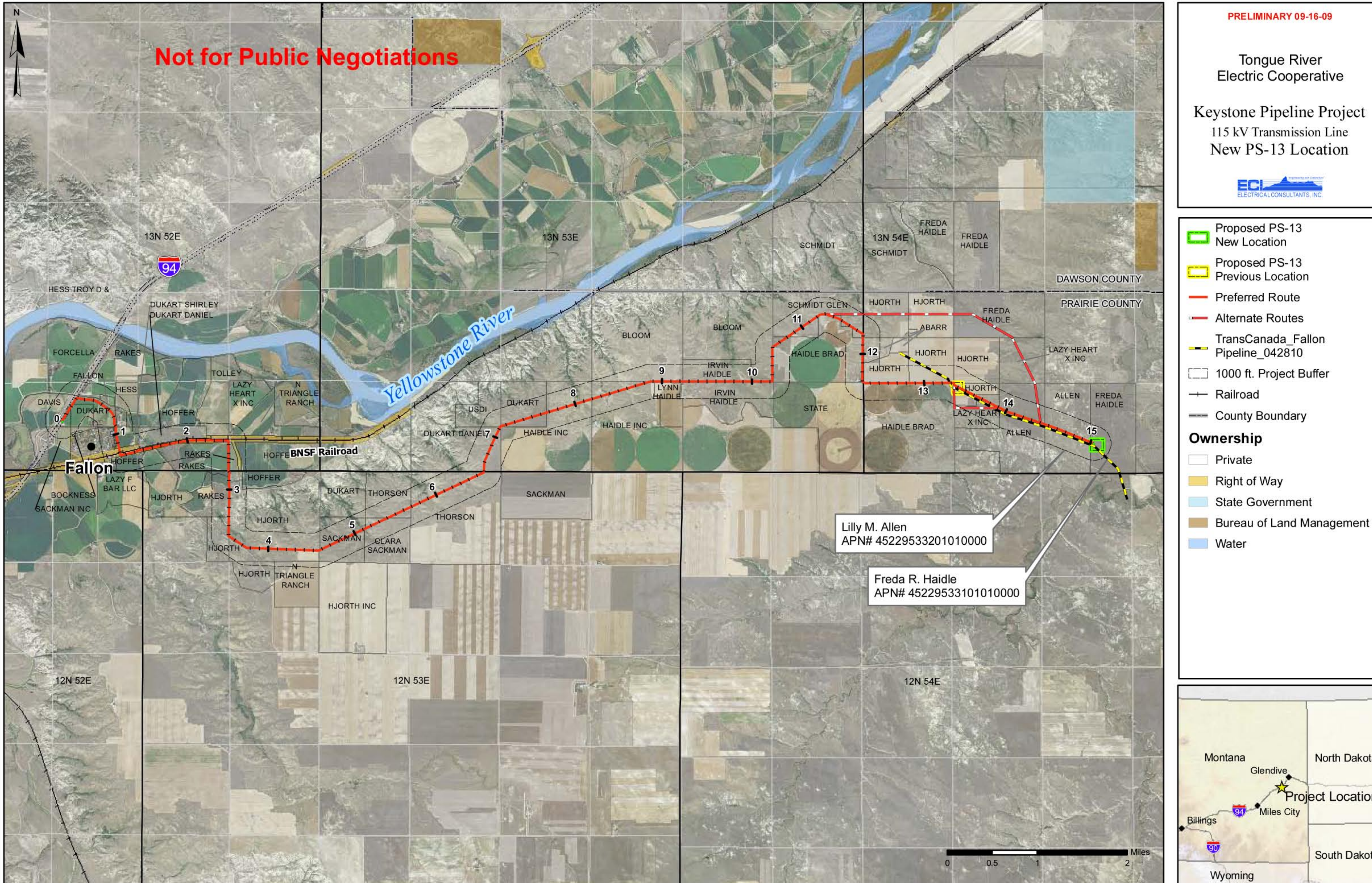
CORPORATE OFFICE:
3521 GABEL ROAD
BILLINGS, MT 59102
PHONE: 406-259-9933
FAX: 406-259-1164
EMAIL: contact-us@ecibillings.com

SALT LAKE CITY OFFICE:
660 WEST 700 SOUTH
WOODS CROSS, UT 84087
PHONE: 801-292-9954
FAX: 801-292-9177
EMAIL: contact-us@ecislc.com

TUCSON OFFICE
6740 NORTH ORACLE RD, #100
TUCSON, AZ 85704
PHONE: [illegible]
FAX: [illegible]
EMAIL: [illegible]

MADISON OFFICE:
2800 ROYAL AVENUE #300
MONONA, WI 53713
PHONE: 608-240-9933
FAX: 608-240-1570
EMAIL: contact-us@ecimadison.com

-This page intentionally left blank-



File: R:\Projects\M33-008_Keystone\GIS\MXD\TongueRiver_060810_NoROE.mxd, Jun 08, 2010 9:39:30 AM

-This page intentionally left blank-

wfec
western farmers
electric cooperative

P.O. Box 429 • Anadarko, Oklahoma 73005-0429 • (405) 247-3351 • www.wfec.com

A Touchstone Energy® Cooperative

September 20, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

Western Farmers Electric Cooperative (WFEC), a power provider located in Oklahoma, is providing electric service to Pump Stations 33 and 35 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. WFEC is required to complete an Environmental Report (ER) for obtaining funding from Rural Utility Service (RUS). Completing the ER requires consultation with the USFWS.

As such, WFEC is in consultation with the USFWS field office in Tulsa, Oklahoma. WFEC has consulted with the Tulsa office on possible impacts to the whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors. In addition, WFEC has also been in consultation concerning the American burying beetle.

Enclosed are proposed maps of the power lines and substations we intend to build to service the Keystone XL Project as well as copies of the consultation letters with the Tulsa office.

If you have any questions please contact me at 405-247-4298 or by email at k_fletcher@wfec.com.

Sincerely,

Kent Fletcher

Kent Fletcher
Environmental Specialist
Western Farmers Electric Cooperative
405-247-4298, Cell 405-255-3887

Copy: Larry Sibbald, Alan Derichsweiler, Scott Williams

wfec
western farmers
electric cooperative

P.O. Box 429 • Anadarko, Oklahoma 73005-0429 • (405) 247-3351 • www.wfec.com

A Touchstone Energy® Cooperative

September 1, 2010

Dr. Dixie Birch
U.S. Fish and Wildlife Service
9014 East 21st Street
Tulsa, OK 74129

RE: Proposed TransCanada Substation and Tap Transmission Line Construction
Section 34 - T10N - R8E
Seminole County, Oklahoma

Dear Dr. Birch,

Western Farmers Electric Cooperative (WFEC) is in the process of preparing an environmental report (ER) for the Rural Utilities Service (RUS). This report will provide details with regard to environmental impacts for the above-referenced project. Construction activities will entail clearing approximately 0.2 acre of mixed native grass pasture for a new substation and constructing 0.5 mile of electrical transmission line with a 100-foot wide right-of-way (ROW). The transmission line will feature H-frame pole structures at approximately 700-foot intervals. Attached is the vegetative cover map showing the approximate project ROW. The project area provides habitat for white-tailed deer and other small to medium-sized mammals. The area may also provide habitat for mourning doves, bobwhite quail, various songbirds, and small game species such as rabbits and squirrels.

Federally-listed species for the county include:

The interior least tern (*Sterna antillarum*) inhabits bare river sandbars with adjacent open reaches of river, broad sandy areas, and salt plains. The least tern leaves Oklahoma by early September and winters along the coast of Central and South America. No suitable habitat for the interior least tern was present on or in the immediate vicinity of the project ROW; therefore, this project will have no effect on the interior least tern.

The piping plover (*Charadrius melodus*) is a migratory shorebird which generally occupies drier portions of open sandy areas along rivers and reservoirs. No suitable habitat for the piping plover was present on or in the immediate vicinity of the project ROW; therefore, this project will have no effect on the piping plover.

The whooping crane (*Grus americana*) inhabits open marshes and wetlands. The species migrates between breeding grounds in the northern US and Canada and the Texas gulf coast. While the project area may be within this migration corridor, no suitable habitat for the whooping crane was present on or in the immediate vicinity of the project ROW; therefore, this project will have no effect on the whooping crane.

The American burying beetle (*Nicrophorus americanus*) (ABB) is an endangered insect that occurs in Oklahoma. The ABB is a nocturnal species which is generally active between May 20 and September 20. During the rest of the year, ABBs remain inactive underground. Approximately six (6) acres of suitable ABB habitat was observed within the proposed project area. During July 2010, ENERCON conducted a presence-absence survey according to USFWS guidelines. The results of the survey were positive. Based on the results of the survey, it is assumed that ABBs are present within project area. WFEC will conduct bait way efforts prior to the ABB inactive season. Because of this, the project may affect but is not likely to adversely affect the ABB.

The Arkansas River shiner (*Notropis girardi*) inhabits unshaded, broad, sandy, main channels of major streams and rivers. No suitable habitat for the Arkansas River shiner was present on or in the immediate vicinity of the project ROW. This project will have no effect on the Arkansas River shiner or critical habitat designated for this species.

WFEC is seeking your concurrence with the above findings.

Additional project issues:

A delineation of potential Section 404 resources (i.e. wetlands and other waters of the US) documented two small wetlands and a farm pond within the proposed project ROW. Storm water best management practices (BMPs) will be implemented prior to construction to ensure that sediment is not discharged into the receiving waters.

Federal Emergency Management Agency (FEMA) floodplain maps were reviewed for Seminole County. The proposed project area is not located within a mapped floodplain. Because of this, Seminole County Floodplain Construction Permits are not required for the proposed project.

WFEC would like to start construction on this project as soon as possible. We would appreciate your response within 30 days. If WFEC does not hear from your agency within the 30 days we will assume you have no comments regarding the project. If you have any questions or need further information please call me at (405) 247-4298 or contact me by email at k_fletcher@wfec.com.

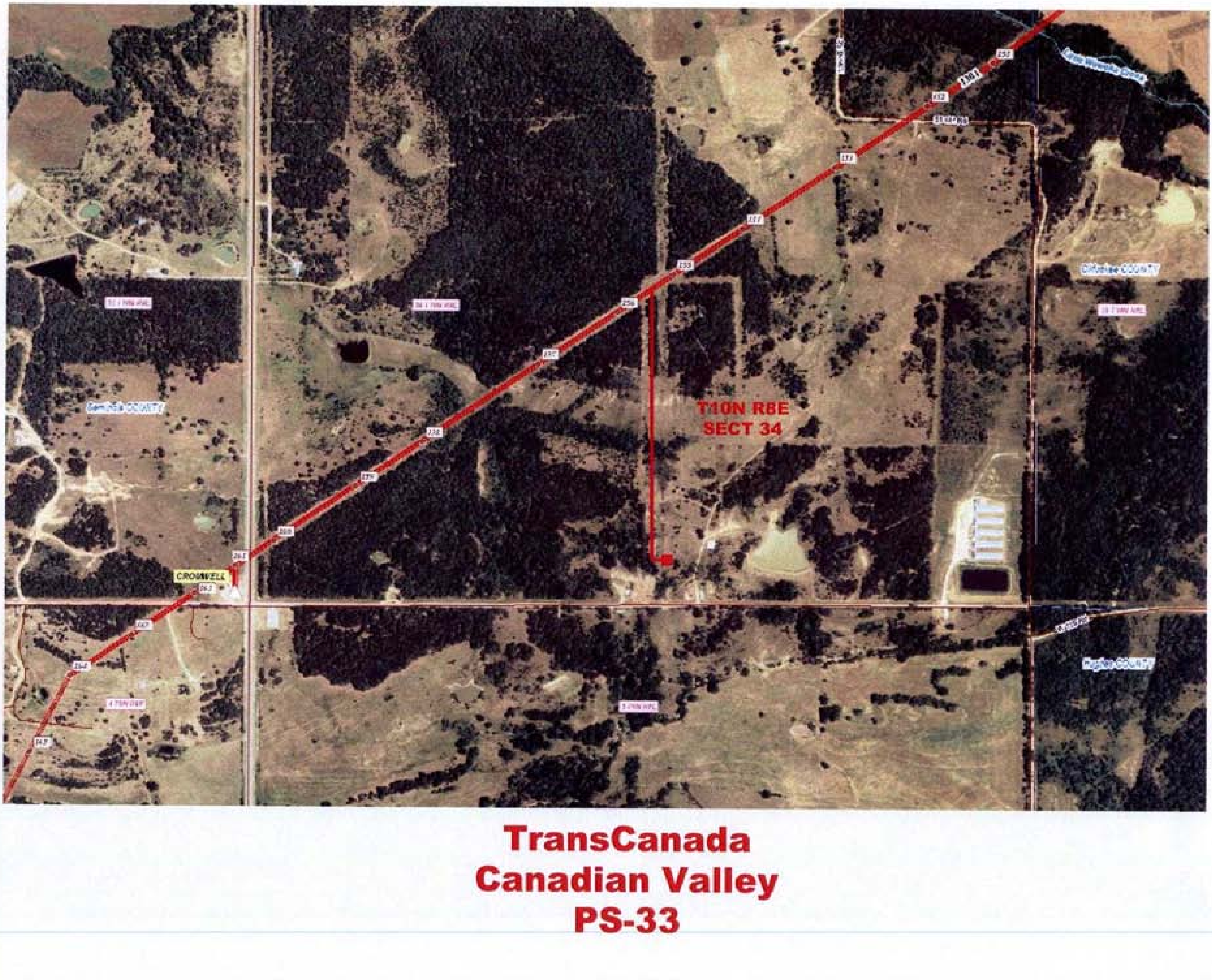
Sincerely,

Kent Fletcher

Kent Fletcher
Environmental Specialist

Copy: Eddie Childs, Kyle Power, Steve Coon
File: TransCanada Substation and Tap Transmission Line

Attachments:
Vegetative Cover Map



TransCanada
Canadian Valley
PS-33

McCONE ELECTRIC CO-OP., INC.

P.O. Box 368
CIRCLE, MONTANA 59215

TELEPHONE (406) 485-3430
(800) 684-3605
FAX (406) 485-3397

October 13, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

McCone Electric Cooperative Inc, a power provider located in Circle Montana, is providing electric service to Pump Station 12 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. The attached letter was reviewed and the electrical service provided by McCone is outside of the Whooping Crane Migratory Corridor, and the construction of the proposed line will not likely impact the whooping crane.

However, we would still like to consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

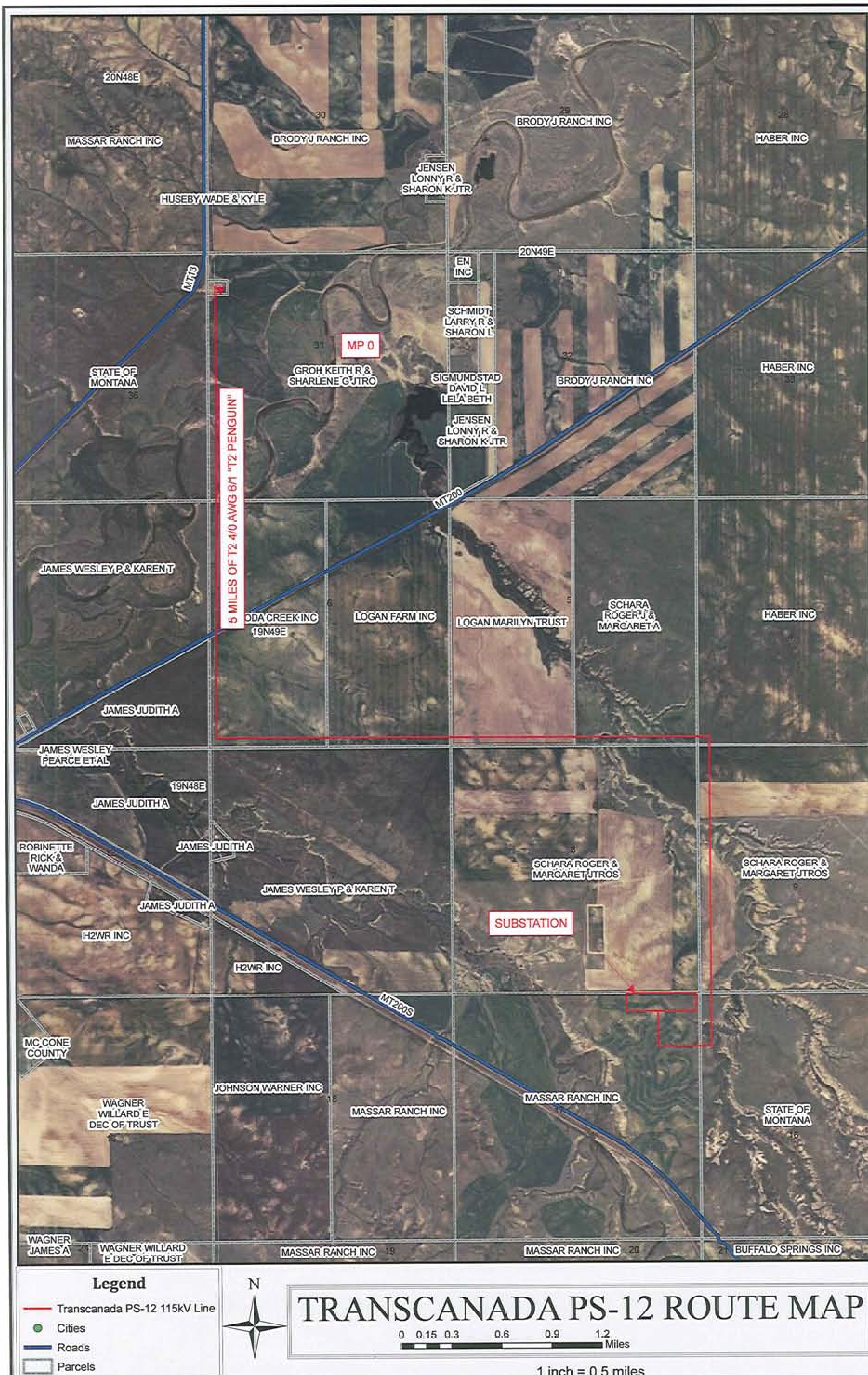
Enclosed is a map showing the proposed location of the power line we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Best regards,
McCone Electric Co-op., Inc.

Mike C. Kays
General Manager

Enclosure: PS#12 Final Transmission Route Map

-This page intentionally left blank-



TRANSCANADA PS-12 ROUTE MAP

-This page intentionally left blank-

WEST CENTRAL Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

PO Box 17
204 Main St.
Murdo SD 57559

Phone (605) 669-2472 or 1-800-242-9232
Fax (605) 669-2358 Email wcec@wce.coop

November 10, 2010

John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Cochnar:

West Central Electric Cooperative, Inc., a power provider located in Murdo, South Dakota, is providing electric service to Pump Stations 18 and 19 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Sincerely,

WEST CENTRAL ELECTRIC CO-OP., INC.

Steven J. Reed
CEO/Manager

SJR:bm

OGE Energy Corp. PO Box 321
Oklahoma City, Oklahoma 73101-0321
405-553-3000
www.oge.com

October 7, 2010

OG&E

Mr. John Cochnar
Acting Field Supervisor
U.S. Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Keystone XL Pipeline Project

Dear Mr. Cochnar:

In a letter dated June 1, 2010, the United States Fish and Wildlife Service's (USFWS) Field Office in Grand Island Nebraska informed the United States Department of State that it had reviewed the latter's Draft Biological Assessment (DBA) associated with the above referenced Project. In the letter, the USFWS stated that, based on its review of the DBA, it believes that the Project may affect and is likely to adversely affect the Whooping Crane, Least Tern, Piping Plover and Western Prairie Fringed Orchid based on the proposed installation of overhead power lines that will provide electrical service to the various pump stations to be located along the pipeline's route.

This is to inform you that OGE Energy Corp. will be providing electric service to one such pump station (i.e. Pump Station No. 32) to be located near Cushing, Oklahoma. In order to provide electrical service to the pump station, overhead power lines will be installed. In that regard, OGE agrees to consult with the USFWS's field office in Tulsa, Oklahoma regarding any mitigative or protective measures that can be incorporated into the design of the power lines in order to minimize their impact on the Whooping Crane, Interior Least Tern and Piping Plover along the power line's corridor.

Once the line route has been finalized, a map depicting the same will be provided to the Tulsa field office. In the meantime, should you have any questions concerning OGE's involvement in the project, feel free to call me at (405) 553-3177.

Sincerely,

K. E. Raymond

Kenneth E. Raymond
Sr. Env. Regulatory Analyst
Corp. Env., Health & Safety
OGE Energy Corp.

WM1938

Westar Energy.

November 12, 2010

John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Dear Mr. Cochnar,

This letter is sent to assure you of Westar Energy's intent to comply with USF&WS regulations in our construction of lines associated with the Keystone XL Pipeline Project in Kansas. We routinely work with Dan Mulhern and Mike LeValley of your Ecological Services office in Manhattan, Kansas. If you have questions or concerns, please don't hesitate to contact me.

Sincerely,

Brad Loveless

Brad Loveless
Director, Biology & Cons. Programs
Westar Energy

cc: Stacy Kramer, Westar Energy
Larry Sibbald, Trans Canada

File: ENV705.1211

Nebraska Public Power District

Always there when you need us

September 14, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Nebraska Public Power District Transmission Lines
(Keystone XL Pipeline Pump Stations #22, #23, and #24)

Dear Mr. Cochnar:

It is Nebraska Public Power Districts (NPPD) understanding that as a result of recent conversations between the USFWS and TransCanada that each power provider associated with the Keystone XL Project is being asked to provide USFWS with a letter indicating the willingness of power providers to work with USFWS regarding threatened and endangered species.

Nebraska Public Power District (NPPD) is a supplier of retail and wholesale electric service in Nebraska. Pump stations associated with the Keystone XL Project will require electric service and will represent significant electric loads to the local electric service provider. While NPPD will not be providing electric service directly to these pump stations at a retail level, NPPD will provide electric service to NPPD wholesale customers, who in turn will provide electric service to the pump stations. In order for the wholesale customers to provide reliable electric service to Keystone XL Pump Stations #22, #23, and #24, NPPD must construct additional 115 kV transmission lines. Accordingly, NPPD has established three separate 115 kV transmission line projects.

NPPD follows a very structured route identification and selection process with an emphasis on public involvement, including coordination with various agencies that may have jurisdiction in the line route study areas. For these three transmission line projects, the route selection process was initiated by NPPD in June 2009. NPPD held initial meetings with the Nebraska Game and Parks Commission (NGPC) and the US Fish & Wildlife Service (USFWS) to provide an overview of the projects and to begin discussions regarding threatened and endangered species in July 2009. At that time, primary points of contact with the NGPC (Michelle Koch) and the USFWS (Bob Harms) were also established. NPPD continued to coordinate with the NGPC and the USFWS at each step of the line route selection process including identification of line route corridors, alternate line routes and final route selection. Line routes for these three projects were finalized in early September 2010.

General Office
1414 15th Street / PO Box 499 / Columbus, NE 68602-0499
***Telephone:** (402) 564-8561 / **Fax:** (402) 563-5527*
www.nppd.com

NPPD has demonstrated its commitment to coordinate and consult with the USFWS and the NGPC to address impacts of these three transmission line projects during route selection. Copies of letters NPPD received from both the NGPC and the USFWS related to these projects which demonstrate NPPD's coordination efforts are attached. NPPD is committed to continue such coordination with both agencies regarding measures that may need to be incorporated into the design and/or construction of the transmission lines to address potential impacts to threatened and endangered species that may occur in certain specific areas along the line routes. Prior to the beginning of construction, NPPD, the NGPC and the USFWS will determine and agree upon what measures are specifically warranted for each line route.

Copies of maps showing the routes for the 115 kV transmission lines to be built to service Keystone XL Project pump stations #22, #23 and #24 are enclosed.

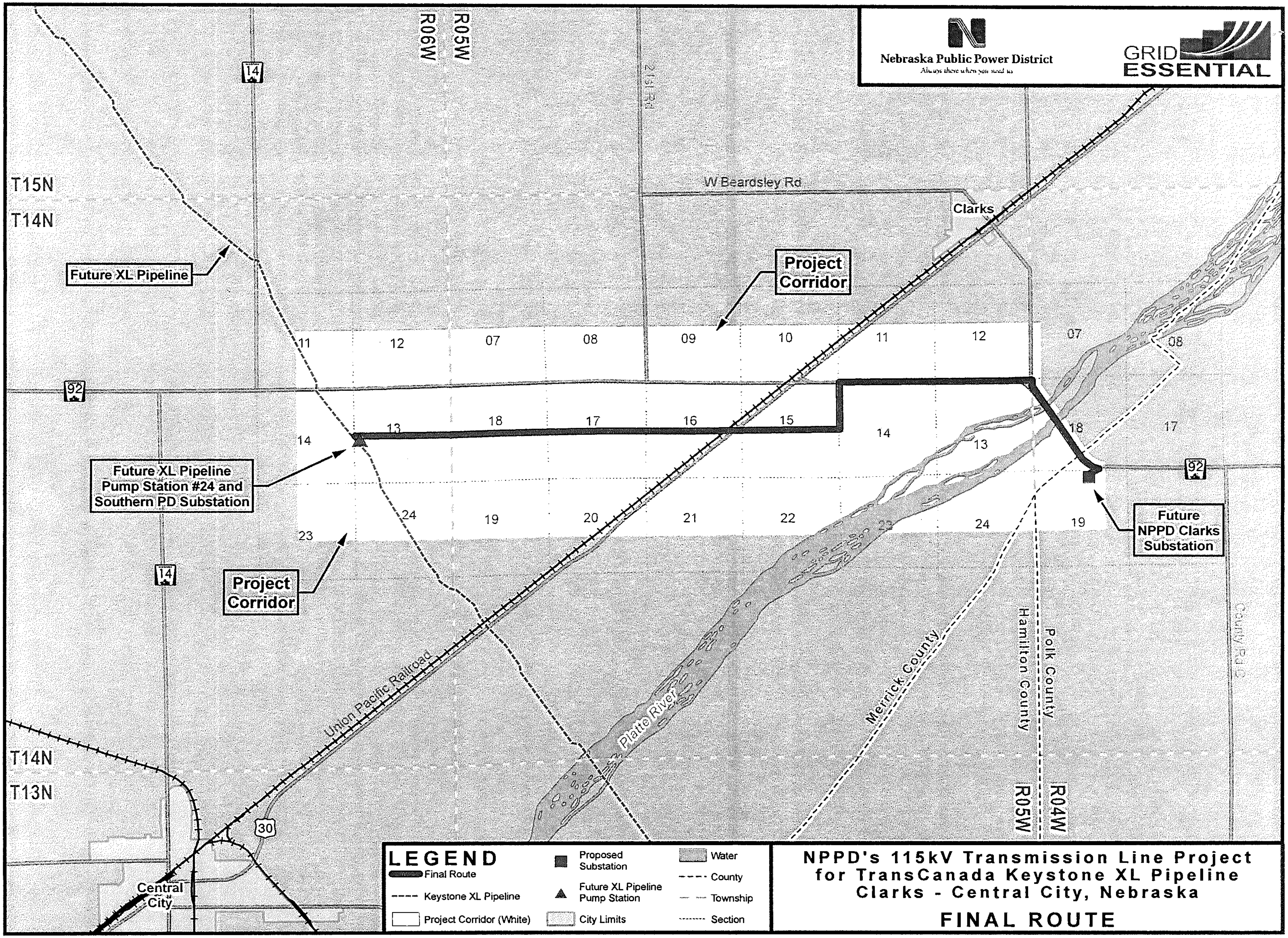
Please contact me at 402-563-5355 if you have any questions or require additional information.

Sincerely,

Joe L. Citta, Jr.
Environmental Manager

Attachments

Cc: Robert Harms (USFWS)
Michelle Koch (NGPC)
Larry Sibbald (TransCanada)
Don Veseth (NPPD)



NPPD's 115kV Transmission Line Project for TransCanada Keystone XL Pipeline Clarks - Central City, Nebraska

FINAL ROUTE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Nebraska Field Office
203 West Second Street
Grand Island, Nebraska 68801

June 1, 2010

Mr. Joe L. Citta
Corporate Environmental Manager
Nebraska Public Power District
1414 15th Street
PO Box 499
Columbus, NE 68602-0499

Dear Mr. Citta:

Please make reference to a letter from the Nebraska Public Power District (NPPD) dated May 10, 2010, which summarized discussions at a recent April 7, 2010, meeting about a proposed 115 kV transmission line construction project extending from Clarks to Central City, Nebraska. As you know, representatives of the NPPD, U.S. Fish and Wildlife Service, and Nebraska Game and Parks Commission previously met on several occasions during the planning phases of this project to identify and discuss potential threatened and endangered species impacts. We acknowledge and commend NPPD's commitment to continue coordination with us to address potential impacts to these species. Measures to address and/or avoid potential impacts include species surveys and potential temporal avoidance in areas which provide suitable habitat. Implementation of agreed upon measures where suitable habitat is present along the final line route would satisfactorily address impacts to threatened and endangered species.

We appreciate the opportunity to review and comment on the proposed transmission line project and NPPD's willingness to involve the resource agencies throughout project planning. If you have any questions regarding these comments, please contact Mr. Robert Harms of this office at Robert_Harms@fws.gov or telephone number (308) 382-6468, extension 17.

John Cochnar

John Cochnar
Acting Nebraska Field Supervisor

cc: NGPC; Lincoln, NE (Attn: Michelle Koch)

NEBRASKA
—GAME PARKS—

Nebraska Game and Parks Commission
2200 N. 33rd St. • P.O. Box 30370 • Lincoln, NE 68503-0370 • Phone: 402-471-0641 • Fax: 402-471-5528

June 10, 2010

Sara Hayek
Nebraska Power Review Board
301 Centennial Mall South, 5th Floor
Lincoln, NE 68509

Re: Application No. PRB-3629, Clarks to Central City, 9 miles of 115 kV transmission line, Merrick and Polk Counties, Nebraska

Dear Ms. Hayek:

Please make reference to your letter dated May 24, 2010. This letter is in response to your request for a review of this project's potential impacts to threatened and endangered species in Merrick and Polk Counties in Nebraska. As we understand it, the project involves constructing 9 miles of 115 kV line to provide an energy source for the TransCanada Keystone XL Pipeline Pumping Station (PS-24). We have completed our review of the proposed sites under Neb. Rev. Stat. § 37-807 (3) of the Nongame and Endangered Species Conservation Act and we offer the following comments.

Staff from the Nebraska Game and Parks Commission (NGPC) and the Nebraska Public Power District (NPPD) have had numerous meetings dating back to July 2009 to discuss the Clarks to Central City transmission line project. Staff from the U.S. Fish and Wildlife Service, Nebraska Field Office, Grand Island, was also present at those meetings. Through the course of these meetings, NPPD has narrowed the project from the initial study area to corridors to preferred and alternative routes. At each of these phases, NGPC has advised NPPD on potential impacts to threatened and endangered species as well as other species protected under federal laws, such as the Migratory Bird Treat Act and the Bald and Golden Eagle Protection Act. NPPD has incorporated this information into the routing process to try to avoid impacts to threatened and endangered species and their habitats when possible.

The project corridor and preferred and alternative routes for this project are within the range of the following state listed threatened and endangered species:

Whooping Crane (*Grus americana*) – state and federal endangered
Interior Least Tern (*Sternula antillarum athalassos*) – state and federal endangered
Piping Plover (*Charadrius melodus*) – state and federal threatened
Western Prairie Fringed Orchid (*Platanthera praeclara*) – state and federal threatened
Small White Lady's Slipper (*Cypripedium candidum*) – state threatened
River Otter (*Lutra canadensis*) – state threatened

Through the aforementioned discussions, NPPD has agreed to determine if suitable habitat for each of these species is present within the area that will be impacted by construction activities. If suitable habitat is present, then NPPD will conduct additional surveys to determine if these species are present. In the event one or more of these species are present, then NGPC and NPPD will cooperatively develop conservation measures to address potential impacts.

Since NPPD has taken the appropriate steps through the consultation process to avoid adverse impacts to threatened and endangered species, we have no objection to the selected corridor or the routes within the corridor. Additionally, NPPD has committed to continued coordination with our agency as the final route is selected and constructed. They have agreed to mark certain portions of the line with bird diverters if necessary and to conduct appropriate surveys for the threatened and endangered species listed above.

Therefore, we have determined this project "may affect but is not likely to adversely affect" state-listed threatened or endangered species. We made this determination based on discussions and meetings with NPPD, the continued commitment to coordinate with our agency, a review of the material you sent, aerial photographs, topographic maps and our Nebraska Natural Heritage Database.

Based upon the submitted information, we have no objection to the proposal as currently planned. If the proposed project is changed or new information regarding threatened or endangered species becomes available, then this determination is no longer valid and further consultation with the Nebraska Game and Parks Commission will be necessary.

All federally listed threatened and endangered species are also state listed. For assessment of potential impacts on federally listed, candidate or proposed threatened or endangered species, please contact John Cochnar, Nebraska Field Office, U.S. Fish and Wildlife Service, 203 W. Second St., Grand Island, NE 68801.

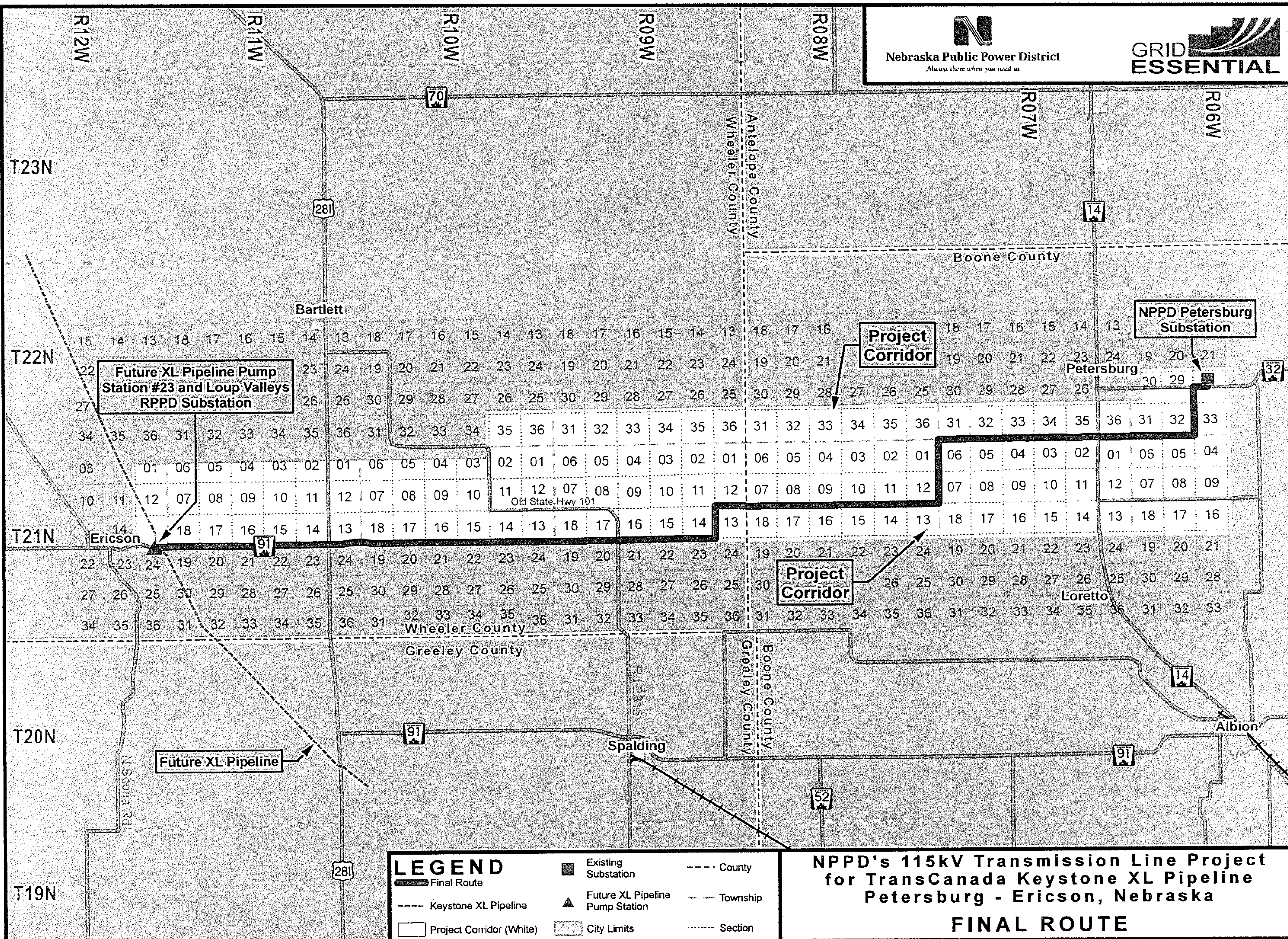
Thank you for the opportunity to comment. If you have any questions or need additional information, please feel free to contact me.

Sincerely,

Michelle R Koch

Michelle R. Koch
Environmental Analyst Supervisor
Nebraska Natural Heritage Program
Nebraska Game and Parks Commission
(402) 471-5438, michelle.koch@nebraska.gov

CC: John Cochnar, USFWS
Robert Harms, USFWS
Joe Citta, NPPD
Larry Linder, NPPD


Nebraska Public Power District
Always there when you need us
GRID ESSENTIAL
NPPD's 115kV Transmission Line Project
for TransCanada Keystone XL Pipeline
Petersburg - Ericson, Nebraska
FINAL ROUTE
LEGEND
Final Route
Keystone XL Pipeline
Project Corridor (White)
Existing Substation
Future XL Pipeline Pump Station
City Limits
County
Township
Section
NPPD Petersburg Substation
Future XL Pipeline Pump Station #23 and Loup Valleys RPPD Substation
Project Corridor
Project Corridor
Future XL Pipeline
Old State Hwy 101
Antelope County
Wheeler County
Boone County
Greeley County
Wheeler County
Greeley County
Boone County
Greeley County
Ericson
Bartlett
Petersburg
Loretto
Albion
Spalding
N Scotia Rd
Rd 2315
R12W
R11W
R10W
R09W
R08W
R07W
R06W
T23N
T22N
T21N
T20N
T19N
70
281
14
32
91
52

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Nebraska Field Office
203 West Second Street
Grand Island, Nebraska 68801

June 1, 2010

Mr. Joe L. Citta
Corporate Environmental Manager
Nebraska Public Power District
1414 15th Street
PO Box 499
Columbus, NE 68602-0499

Dear Mr. Citta:

Please make reference to a letter from the Nebraska Public Power District (NPPD) dated May 10, 2010, which summarized discussions at a recent April 7, 2010, meeting about a proposed 115 kV transmission line construction project extending from Petersburg to Ericson, Nebraska. As you know, representatives of the NPPD, U.S. Fish and Wildlife Service, and Nebraska Game and Parks Commission previously met on several occasions during the planning phases of this project to identify and discuss potential threatened and endangered species impacts. We acknowledge and commend NPPD's commitment to continue coordination with us to address potential impacts to these species. Measures to address and/or avoid potential impacts include species surveys, habitat avoidance, and capture/relocation procedures in areas which provide suitable habitat. Implementation of agreed upon measures where suitable habitat is present along the final line route would satisfactorily address impacts to threatened and endangered species.

We appreciate the opportunity to review and comment on the proposed transmission line project and NPPD's willingness to involve the resource agencies throughout project planning. If you have any questions regarding these comments, please contact Mr. Robert Harms of this office at Robert_Harms@fws.gov or telephone number (308) 382-6468, extension 17.

Sincerely,

John Cochnar

John Cochnar
Acting Nebraska Field Supervisor

cc: NGPC; Lincoln, NE (Attn: Michelle Koch)

NEBRASKA
—GAME PARKS—

Nebraska Game and Parks Commission

2200 N. 33rd St. • P.O. Box 30370 • Lincoln, NE 68503-0370 • Phone: 402-471-0641 • Fax: 402-471-5528

June 10, 2010

Sara Hayek
Nebraska Power Review Board
301 Centennial Mall South, 5th Floor
Lincoln, NE 68509

Re: Application No. PRB-3628, Petersburg to Ericson, 37 miles of 115 kV transmission line, Boone and Wheeler Counties, Nebraska

Dear Ms. Hayek:

Please make reference to your letter dated May 24, 2010. This letter is in response to your request for a review of this project's potential impacts to threatened and endangered species in Boone and Wheeler Counties in Nebraska. As we understand it, the project involves constructing 37 miles of 115 kV line to provide an energy source for the TransCanada Keystone XL Pipeline Pumping Station (PS-23). We have completed our review of the proposed sites under Neb. Rev. Stat. § 37-807 (3) of the Nongame and Endangered Species Conservation Act and we offer the following comments.

Staff from the Nebraska Game and Parks Commission (NGPC) and the Nebraska Public Power District (NPPD) have had numerous meetings dating back to July 2009 to discuss the Petersburg to Ericson transmission line project. Staff from the U.S. Fish and Wildlife Service, Nebraska Field Office, Grand Island, was also present at those meetings. Through the course of these meetings, NPPD has narrowed the project from the initial study area to corridors to preferred and alternative routes. At each of these phases, NGPC has advised NPPD on potential impacts to threatened and endangered species as well as other species protected under federal laws, such as the Migratory Bird Treat Act and the Bald and Golden Eagle Protection Act. NPPD has incorporated this information into the routing process to try to avoid impacts to threatened and endangered species and their habitats when possible.

The project corridor and preferred and alternative routes for this project are within the range of the following state listed threatened and endangered species:

American Burying Beetle (*Nicrophorus americanus*) – state and federal endangered
Whooping Crane (*Grus americana*) – state and federal endangered
Western Prairie Fringed Orchid (*Platanthera praeclara*) – state and federal threatened
Small White Lady's Slipper (*Cypripedium candidum*) – state threatened

Through the aforementioned discussions, NPPD has agreed to determine if suitable habitat for each of these species is present within the area that will be impacted by construction activities. If suitable habitat is present, then NPPD will conduct additional surveys to determine if these species are present. In the event one or more of these species are present, then NGPC and NPPD will cooperatively develop conservation measures to address potential impacts.

Since NPPD has taken the appropriate steps through the consultation process to avoid adverse impacts to threatened and endangered species, we have no objection to the selected corridor or the routes within the corridor. Additionally, NPPD has committed to continued coordination with our agency as the final route is selected and constructed. They have agreed to mark certain portions of the line with bird diverters if necessary and to conduct appropriate surveys for the threatened and endangered species listed above.

Therefore, we have determined this project "may affect but is not likely to adversely affect" state-listed threatened or endangered species. We made this determination based on discussions and meetings with NPPD, the continued commitment to coordinate with our agency, a review of the material you sent, aerial photographs, topographic maps and our Nebraska Natural Heritage Database.

Based upon the submitted information, we have no objection to the proposal as currently planned. If the proposed project is changed or new information regarding threatened or endangered species becomes available, then this determination is no longer valid and further consultation with the Nebraska Game and Parks Commission will be necessary.

All federally listed threatened and endangered species are also state listed. For assessment of potential impacts on federally listed, candidate or proposed threatened or endangered species, please contact John Cochnar, Nebraska Field Office, U.S. Fish and Wildlife Service, 203 W. Second St., Grand Island, NE 68801.

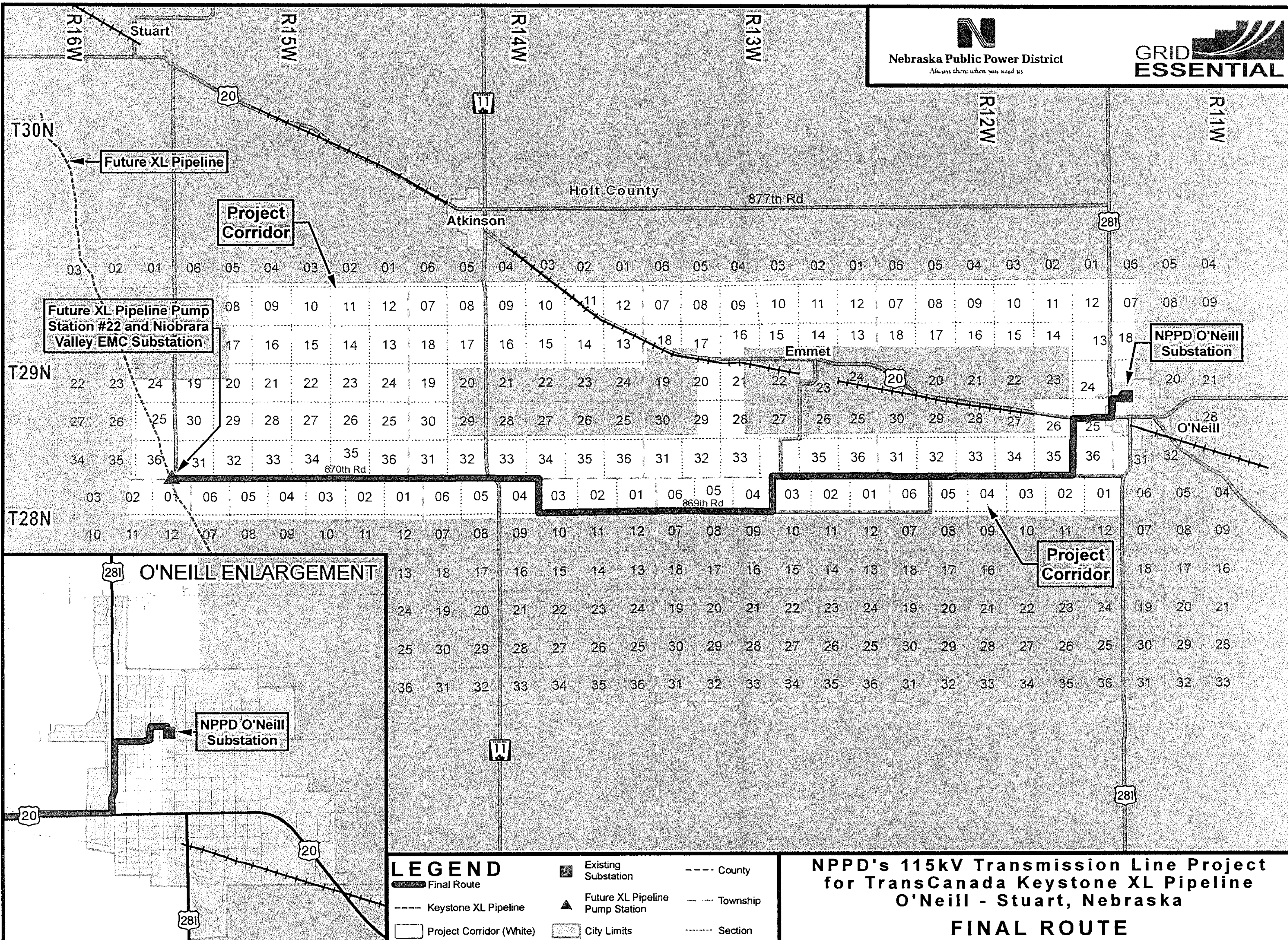
Thank you for the opportunity to comment. If you have any questions or need additional information, please feel free to contact me.

Sincerely,

Michelle R Koch

Michelle R. Koch
Environmental Analyst Supervisor
Nebraska Natural Heritage Program
Nebraska Game and Parks Commission
(402) 471-5438, michelle.koch@nebraska.gov

CC: John Cochnar, USFWS
Robert Harms, USFWS
Joe Citta, NPPD
Larry Linder, NPPD



NPPD's 115kV Transmission Line Project for TransCanada Keystone XL Pipeline O'Neill - Stuart, Nebraska

FINAL ROUTE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Nebraska Field Office
203 West Second Street
Grand Island, Nebraska 68801

June 1, 2010

Mr. Joe L. Citta
Corporate Environmental Manager
Nebraska Public Power District
1414 15th Street
PO Box 499
Columbus, NE 68602-0499

Dear Mr. Citta:

Please make reference to a letter from the Nebraska Public Power District (NPPD) dated May 10, 2010, which summarized discussions at a recent April 7, 2010, meeting about a proposed 115 kV transmission line construction project extending from O'Neill to Stuart, Nebraska. As you know, representatives of the NPPD, U.S. Fish and Wildlife Service, and Nebraska Game and Parks Commission previously met on several occasions during the planning phases of this project to identify and discuss potential threatened and endangered species impacts. We acknowledge and commend NPPD's commitment to continue coordination with us to address potential impacts to these species. Measures to address and/or avoid potential impacts include species surveys, habitat avoidance, and capture/relocation procedures in areas which provide suitable habitat. Implementation of agreed upon measures where suitable habitat is present along the final line route would satisfactorily address impacts to threatened and endangered species.

We appreciate the opportunity to review and comment on the proposed transmission line project and NPPD's willingness to involve the resource agencies throughout project planning. If you have any questions regarding these comments, please contact Mr. Robert Harms of this office at Robert_Harms@fws.gov or telephone number (308) 382-6468, extension 17.

Sincerely,

John Cochnar
Acting Nebraska Field Supervisor

cc: NGPC; Lincoln, NE (Attn: Michelle Koch)

NEBRASKA
—GAME PARKS—

Nebraska Game and Parks Commission
2200 N. 33rd St. • P.O. Box 30370 • Lincoln, NE 68503-0370 • Phone: 402-471-0641 • Fax: 402-471-5528

June 10, 2010

Sara Hayek
Nebraska Power Review Board
301 Centennial Mall South, 5th Floor
Lincoln, NE 68509

Re: Application No. PRB-3627, O'Neill to Stuart, 28 miles of 115 kV transmission line, Holt County, Nebraska

Dear Ms. Hayek:

Please make reference to your letter dated May 24, 2010. This letter is in response to your request for a review of this project's potential impacts to threatened and endangered species in Holt County, Nebraska. As we understand it, the project involves constructing 28 miles of 115 kV line to provide an energy source for the TransCanada Keystone XL Pipeline Pumping Station (PS-22). We have completed our review of the proposed sites under Neb. Rev. Stat. § 37-807 (3) of the Nongame and Endangered Species Conservation Act and we offer the following comments.

Staff from the Nebraska Game and Parks Commission (NGPC) and the Nebraska Public Power District (NPPD) have had numerous meetings dating back to July 2009 to discuss the O'Neill to Stuart transmission line project. Staff from the U.S. Fish and Wildlife Service, Nebraska Field Office, Grand Island, was also present at those meetings. Through the course of these meetings, NPPD has narrowed the project from the initial study area to corridors to preferred and alternative routes. At each of these phases, NGPC has advised NPPD on potential impacts to threatened and endangered species as well as other species protected under federal laws, such as the Migratory Bird Treat Act and the Bald and Golden Eagle Protection Act. NPPD has incorporated this information into the routing process to try to avoid impacts to threatened and endangered species and their habitats when possible.

The project corridor and preferred and alternative routes for this project are within the range of the following state listed threatened and endangered species:

American Burying Beetle (*Nicrophorus americanus*) – state and federal endangered
Whooping Crane (*Grus americana*) – state and federal endangered
Western Prairie Fringed Orchid (*Platanthera praeclara*) – state and federal threatened
Small White Lady's Slipper (*Cypripedium candidum*) – state threatened
River Otter (*Lutra canadensis*) – state threatened

Through the aforementioned discussions, NPPD has agreed to determine if suitable habitat for each of these species is present within the area that will be impacted by construction activities. If suitable habitat is present, then NPPD will conduct additional surveys to determine if these species are present. In the event one or more of these species are present, then NGPC and NPPD will cooperatively develop conservation measures to address potential impacts.

Since NPPD has taken the appropriate steps through the consultation process to avoid adverse impacts to threatened and endangered species, we have no objection to the selected corridor or the routes within the corridor. Additionally, NPPD has committed to continued coordination with our agency as the final route is constructed. They have agreed to mark certain portions of the line with bird diverters if necessary and to conduct appropriate surveys for the threatened and endangered species listed above.

Therefore, we have determined this project "may affect but is not likely to adversely affect" state-listed threatened or endangered species. We made this determination based on discussions and meetings with NPPD, the continued commitment to coordinate with our agency, a review of the material you sent, aerial photographs, topographic maps and our Nebraska Natural Heritage Database.

Based upon the submitted information, we have no objection to the proposal as currently planned. If the proposed project is changed or new information regarding threatened or endangered species becomes available, then this determination is no longer valid and further consultation with the Nebraska Game and Parks Commission will be necessary.

All federally listed threatened and endangered species are also state listed. For assessment of potential impacts on federally listed, candidate or proposed threatened or endangered species, please contact John Cochnar, Nebraska Field Office, U.S. Fish and Wildlife Service, 203 W. Second St., Grand Island, NE 68801.

Thank you for the opportunity to comment. If you have any questions or need additional information, please feel free to contact me.

Sincerely,

Michelle R Koch

Michelle R. Koch
Environmental Analyst Supervisor
Nebraska Natural Heritage Program
Nebraska Game and Parks Commission
(402) 471-5438, michelle.koch@nebraska.gov

CC: John Cochnar, USFWS
Robert Harms, USFWS
Joe Citta, NPPD
Larry Linder, NPPD

PUBLIC UTILITIES COMMISSION

CITY OF CLAY CENTER

MUNICIPAL ELECTRIC & WATER

MICHAEL FLOERSCH, Chairman
GARY GRIFFITHS, Commissioner
DONALD BUTTON, Commissioner
BILL CALLAWAY, Superintendent

427 Court Street
P.O. Box 117
Clay Center, Kansas 67432
(785) 632-2137
Fax (785) 632-6317
Email: bcpuc@nckcn.com

September 14, 2010

Mr. John Cochnar
Acting Field Supervisor
US Fish and Wildlife Service
203 West Second Street
Grand Island, NE 68801

Re: Power Lines Serving Keystone XL Pipeline Pump Stations

Dear Mr. Crochnar:

Clay Center Public Utilities Commission, a power provider located in Clay Center, Kansas, is providing electric service to Pump Station 27 of the Keystone XL Pipeline Project. As part of the environmental review of the Keystone XL Project, we understand certain impacts associated with the power lines being constructed by all power providers has to be reviewed and approved by the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act.

As such, we agree that we will consult with your office on mitigative and protective measures that can be incorporated into the design of the power line facilities in order to minimize impacts to the Whooping crane, interior least tern, and piping plover that may occur in certain specific areas along the power line corridors.

Enclosed are proposed maps of the power lines we intend to permit and build to service the Keystone XL Project. We would appreciate your comments on where the mitigative measures need to be incorporated and what measures are specifically warranted.

Sincerely,

Bill Callaway
Supt. of Utilities
Clay Center Public Utilities Commission

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC.
CORPORATE OFFICE: 3521 GABEL ROAD, BILLINGS, MONTANA 59102 • PHONE: 406-259-9933 • FAX: 406-259-3441

October 14, 2010

U.S. Fish and Wildlife Service
Attn: Scott Larson, Field Supervisor
420 South Garfield, Suite 400
Pierre, SD 57501-5408

RE: Grand Electric Cooperative, Inc. PS15, PS16 and PS17 TransCanada Facilities Construction Work Plan (CWP) and Borrower's Environmental Report (BER)

Dear Mr. Larson:

Electrical Consultants, Inc. (ECI) is currently assisting Grand Electric Cooperative, Inc. (GEC) with their Construction Work Plan (CWP) and Borrower's Environmental Report (BER) for the PS15, PS16 and PS17 TransCanada Facilities proposed projects located in Harding, Perkins and Meade County, South Dakota. Both the CWP and BER are documents required and requested by the USDA Rural Utilities Service/RUS for funding purposes. As part of this process, we are in need of your agencies comments and/or recommendations with regards to any mitigation measures concerning the identified work.

To better assist you in your review, I've enclosed a GEC CWP Improvements List and other pertinent map(s) showing potential resources of concern with GEC's Service Areas for each of the CWP Substation Service Areas and the projects proposed within each area.

If possible, we would appreciate your comments concerning the proposed construction within thirty (30) days or no later than November 9, 2010. If I've not contacted the correct individual for this request, please inform me so I may forward this information onto that person or department.

If you have no comments, please mail, fax or email a letter stating "no comments". If you have any questions or need additional information, please contact me at (406) 259-9933.

Sincerely,

Linda Lee

Linda Lee
Assistant Environmental Planner

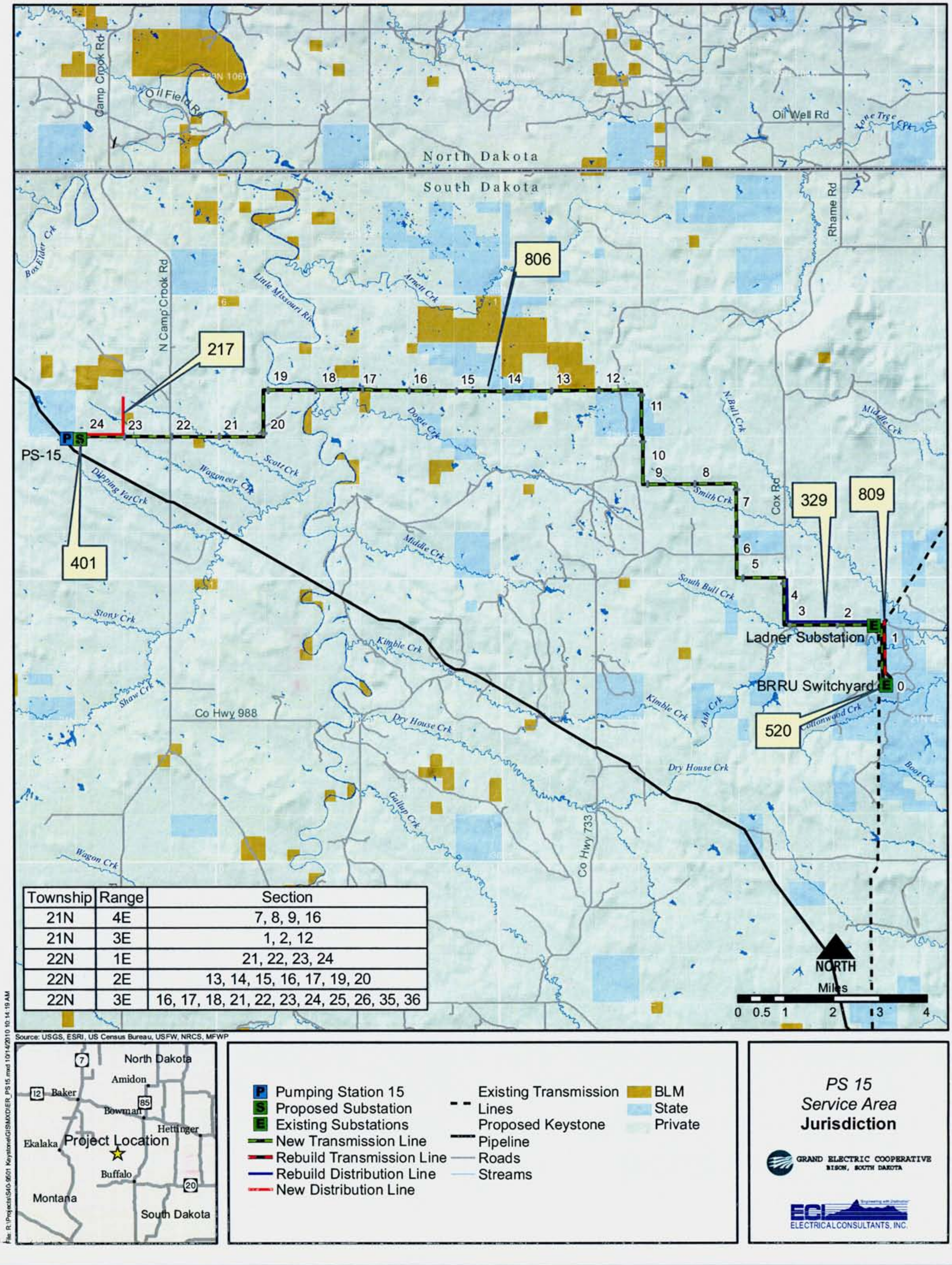
Enc.

R:\Projects\S40-076, 077, 078 PS15, PS16, PS17\Correspondence\US Fish & Wildlife Service - Larson 10.11.10.doc

CWP Project Code	Improvement Descriptions
GEC'S PROPOSED PUMP STATION 15 (PS15)	
217*	This project consists of building 1.9 miles of single phase 14.4 kV, #2 ACSR overhead distribution line. This new build project starts at the proposed new PS15 Substation, (see proposed CWP Project #401 below) which location is planned for design in north east corner of Section 21, this project then travels east for approximately 1.10 miles then heads north for approximately 0.8 miles crossing the Wagoneer Creek. This project is located in Sections 16 and 15 in Harding County, SD
329*	This project consists of rebuilding 3.0 miles of 3 phase 24.9 kV, #4/0 ACSR overhead distribution line with 3 phase #4/0 underground (URD) distribution line. This rebuild starts at the existing transmission line at MP 0 and travels west along County Highway 797 for approximately 2.0 miles then heads directly north for 1.0 mile between Section 1 and Section 6 in Harding County, SD.
401*	This project consists of building a new 115-69 kV PS15 Substation. This new PS15 Substation will be located in the north east corner of Section 21 of Harding County, SD.
520*	This project consists of the addition of a 115 kV bus as well as a 115-69 kV transformer to the existing BRRU Switchyard. This project will not require additional expansion so no additional land will be utilized. The existing BRRU Switchyard is located in Section 16 in Harding County, SD.
806*	This project consists of building approximately 24.1 miles of new 115 kV, 556.5 kCM ACSR overhead transmission line. This project starts at the existing BRRU Switchyard in Section 16 of Harding County, SD and traverses north and west for approximately 19.0 miles when the route heads south for approximately 1.0 miles, turns and heads directly west for an additional 4.1 miles entering into the proposed PS15 Substation.
809*	This project consists of rebuilding 1.25 miles of 115 kV overhead transmission line with 795 kCM ACSR. This proposed project would start at the existing BRRU Switchyard and would travel and tie into the existing Ladner Substation. This project starts in Section 16, travels directly north crossing into Section 9 of Harding County, SD for approximately 1.25 miles.
GEC'S PROPOSED PUMP STATION 16 (PS16)	
218*	This project consists of building 5.5 miles of single phase 14.4 kV, #2 ACSR overhead distribution line. This project starts at the proposed new substation currently planned to be placed in Section 25 in Harding County, SD. The project route will leave the proposed PS16 substation and travels north for approximately 0.3 miles then heads directly west along JB Road for an additional 5.2 miles.
330*	This project consists of rebuilding 2.5 miles of three phase 24.9 kV, #4/0 ACSR overhead distribution line with 3 phase #1/0 underground distribution line (URD). This project starts approximately 3.5 miles south west of Reva, SD and travels along State Highway 20 for 2.5 miles in Harding County, SD
331*	This project consists of rebuilding 0.5 miles of three phase 24.9 kV, #1/0 ACSR overhead distribution line with 3 phase #1/0 underground distribution line (URD). The project starts approximately ½ mile east of 155th Avenue and travels along State Hwy 20 for 0.5 miles. This project is located in Perkins County, SD.
402*	This project consists of building a new 115-69 kV PS16 Substation. This new substation is would be located in the north west corner of Section 25 in Perkins County, SD and approximately 0.3 miles south of JB Road.
522*	This project consists of expanding the 230 kV bus at the existing John Riedy Substation. The existing John Riedy Substation is located in north west corner of Section 16 in Perkins County, SD or approximately 7.0 miles east of Prairie City, SD. The expansion of this substation results in an increase of acreage of .52 acres of farmland of statewide importance.
807*	This project consists of building 41.25 miles of 115 kV overhead transmission line. The line starts just east of 168th Avenue at the existing John Reidy Substation in Perkins County, SD and travels directly west for approximately 33.0 miles, then heads south southwest for the remaining 8.25 miles ending at the proposed new PS16 Substation.
GEC'S PROPOSED PUMP STATION 17 (PS17)	
219*	This project consists of building 0.2 miles of single phase 14.4 kV, #2 ACSR overhead distribution line. This proposed project route starts just outside the proposed Pump Station 17 (PS17) which is proposed to be located just north of Opal Road in Mead County, SD.
406*	This project consists of building a new 115-6.9 kV substation. This proposed project will be located in the south west corner of Section 22 in Meade County, SD.
808*	This project consists of building 10.8 miles of 115 kV, 556.5 kCM ACSR overhead transmission line. This project route starts at the existing Maurine Substation then turns and heads south along Maurine Road for 3.0 miles, then travels east for 1.0 mile, turning south again for 3.0 miles, heads east for 2.0 miles then angles south east for 0.3 miles then turns and heads directly south for 1.8 miles entering into the proposed PS17 Substation. This complete project route is located in Meade County, SD.

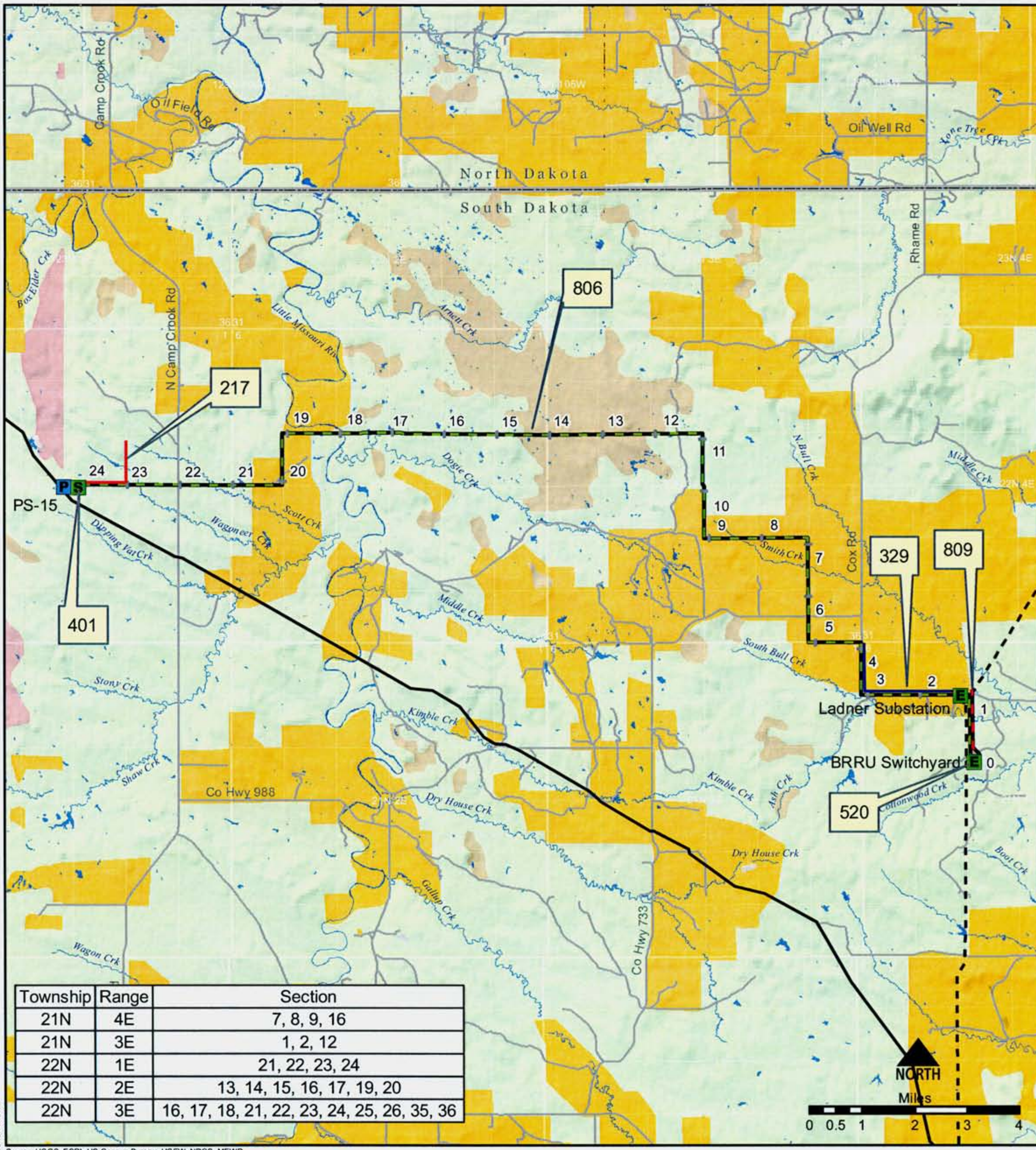
RUS Project Coding Guidelines for Construction Work Plans (CWP) Legend

CWP CODE	CWP PROJECT CODE DESCRIPTION
200*	**Build New Tie Lines – Designates construction of new line for the purpose of connecting two or more existing circuits or substation bus**
300*	**Rebuild Conversion and Line Changes – Designates any conversion or line change of an existing primary circuit required to improve the quality or quantity of service to more than one existing consumer**
400*	**Build a new Substation, Switching Stations or Metering Point**
500*	**Changes to an existing Substation, Switching Station or Metering Point Changes**
800*	**Build new Transmission Lines (both sub-transmission and bulk transmission projects)**



Township	Range	Section
21N	4E	7, 8, 9, 16
21N	3E	1, 2, 12
22N	1E	21, 22, 23, 24
22N	2E	13, 14, 15, 16, 17, 19, 20
22N	3E	16, 17, 18, 21, 22, 23, 24, 25, 26, 35, 36

PS 15
Service Area
Jurisdiction



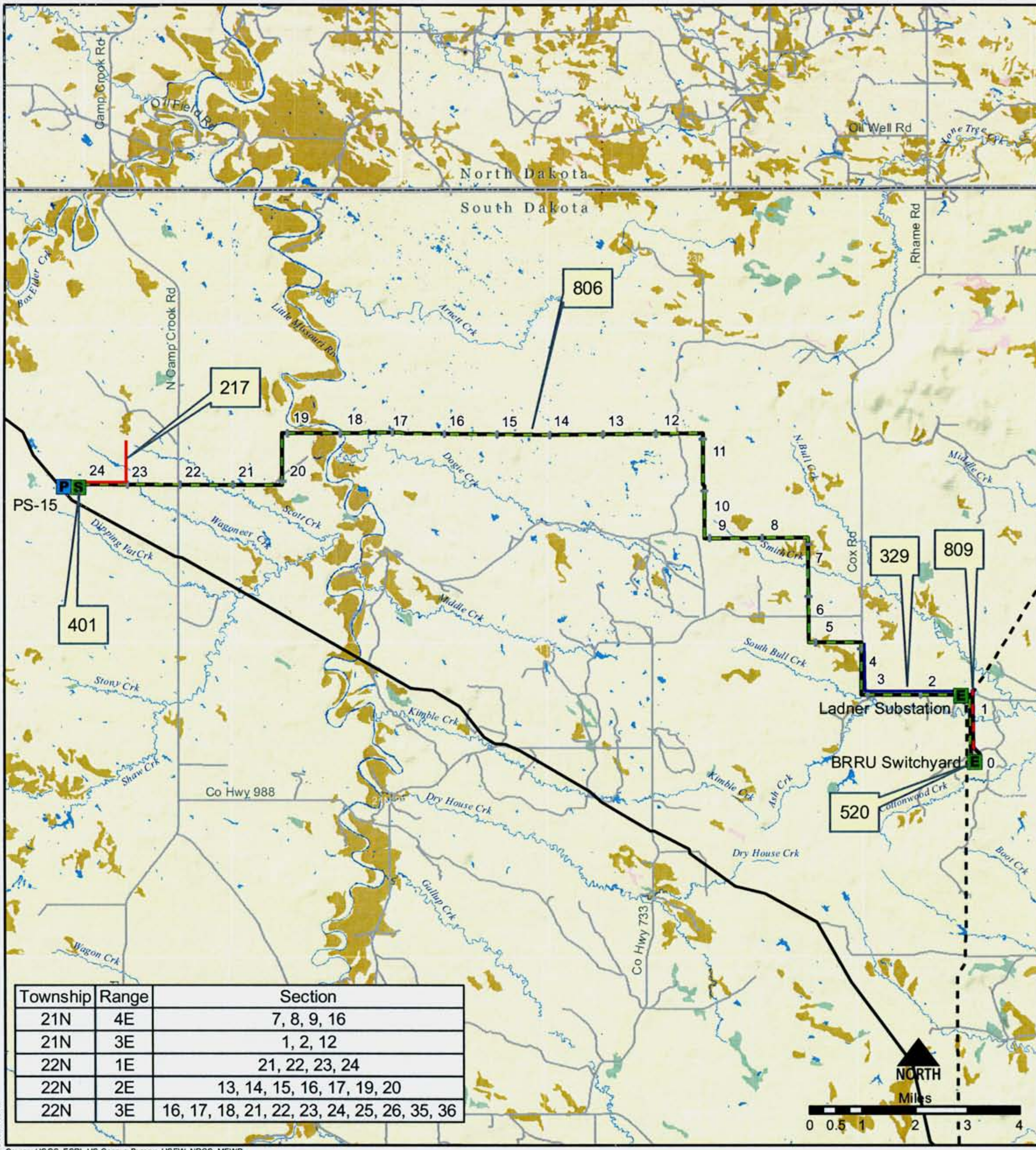
Township	Range	Section
21N	4E	7, 8, 9, 16
21N	3E	1, 2, 12
22N	1E	21, 22, 23, 24
22N	2E	13, 14, 15, 16, 17, 19, 20
22N	3E	16, 17, 18, 21, 22, 23, 24, 25, 26, 35, 36

P Pumping Station 15
S Proposed Substation
E Existing Substations
New Transmission Line
Rebuild Transmission Line
Rebuild Distribution Line
New Distribution Line
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams
Cropland and Pasture
Herbaceous Rangeland
Mixed Rangeland
Sandy areas

PS 15
Service Area
Land Use

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
21N	4E	7, 8, 9, 16
21N	3E	1, 2, 12
22N	1E	21, 22, 23, 24
22N	2E	13, 14, 15, 16, 17, 19, 20
22N	3E	16, 17, 18, 21, 22, 23, 24, 25, 26, 35, 36

Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

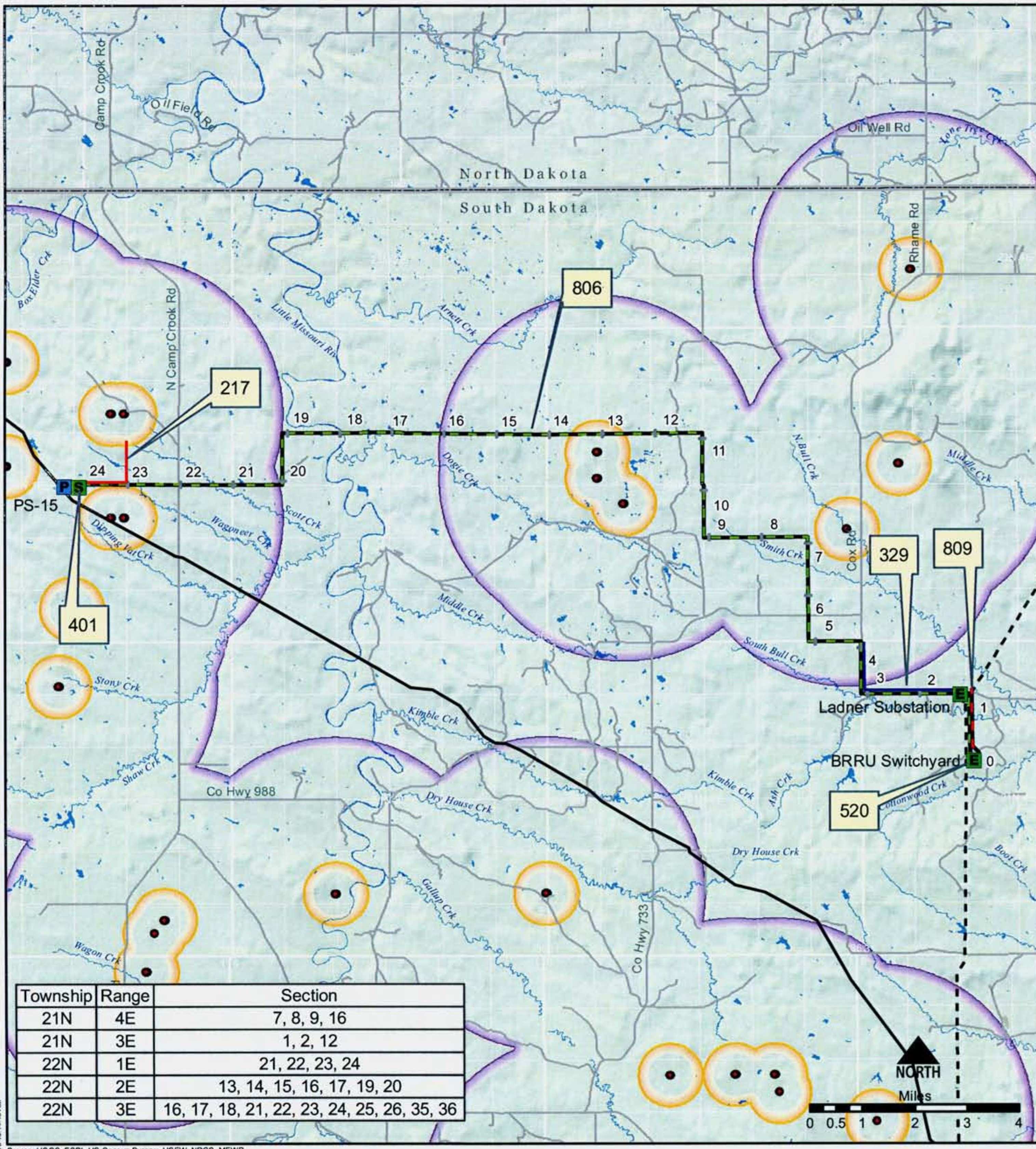
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15.mxd 10/14/2010 10:14:19 AM

- P Pumping Station 15
- S Proposed Substation
- E Existing Substations
- New Transmission Line
- Rebuild Transmission Line
- Rebuild Distribution Line
- New Distribution Line
- Existing Transmission Lines
- Proposed Keystone Pipeline
- Roads
- Streams
- All areas are prime farmland
- Farmland of statewide importance
- Non-prime farmland
- Prime farmland if irrigated

PS 15
Service Area
Prime Farmland

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
21N	4E	7, 8, 9, 16
21N	3E	1, 2, 12
22N	1E	21, 22, 23, 24
22N	2E	13, 14, 15, 16, 17, 19, 20
22N	3E	16, 17, 18, 21, 22, 23, 24, 25, 26, 35, 36

Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

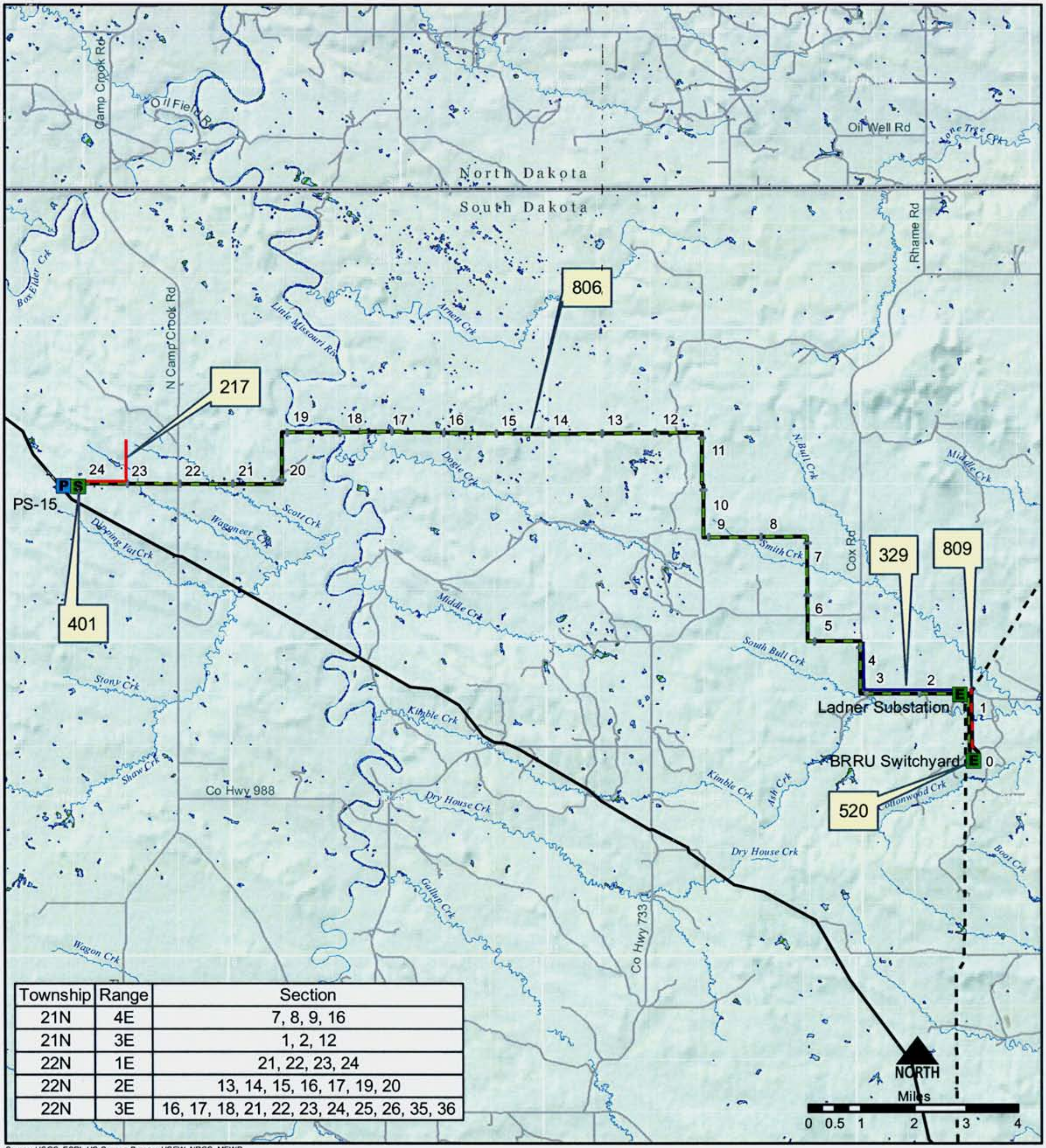
P Pumping Station 15
S Proposed Substation
E Existing Substations
New Transmission Line
Rebuild Transmission Line
Rebuild Distribution Line
New Distribution Line
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams
Sage Grouse Survey Points
.6 mile No Build Buffer
3 mile Restricted Building Buffer

PS 15
Service Area
Sage Grouse

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9601 Keystone\GIS\MXD\ER_PS15.mxd 10/14/2010 10:14:19 AM



Township	Range	Section
21N	4E	7, 8, 9, 16
21N	3E	1, 2, 12
22N	1E	21, 22, 23, 24
22N	2E	13, 14, 15, 16, 17, 19, 20
22N	3E	16, 17, 18, 21, 22, 23, 24, 25, 26, 35, 36

Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

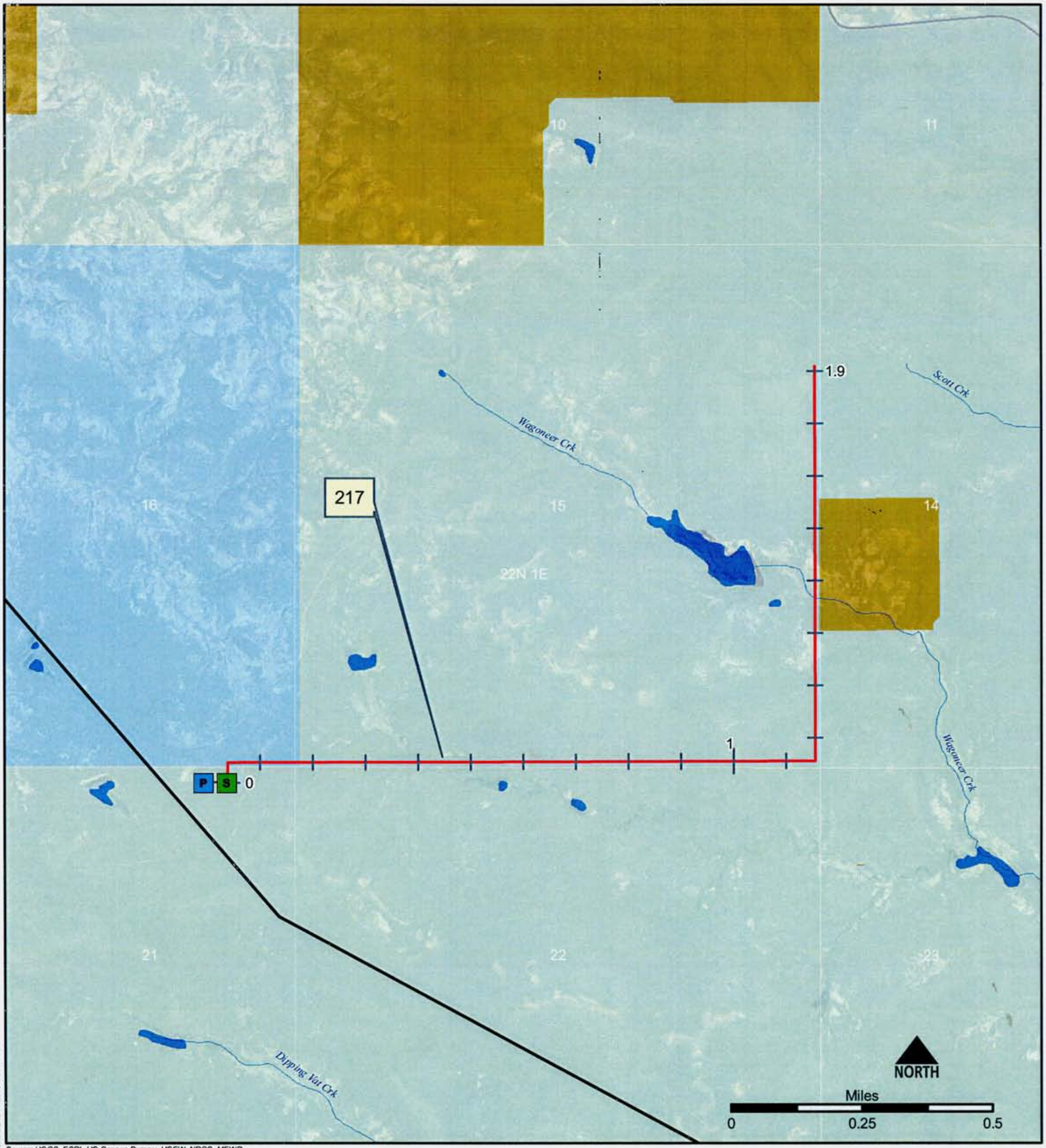
- Pumping Station 15
- Proposed Substation
- Existing Substations
- New Transmission Line
- Rebuild Transmission Line
- Rebuild Distribution Line
- New Distribution Line
- Existing Transmission Lines
- Proposed Keystone Pipeline
- Roads
- Streams
- Wetlands

PS 15
Service Area
Wetlands

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15.mxd 10/14/2010 10:14:19 AM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

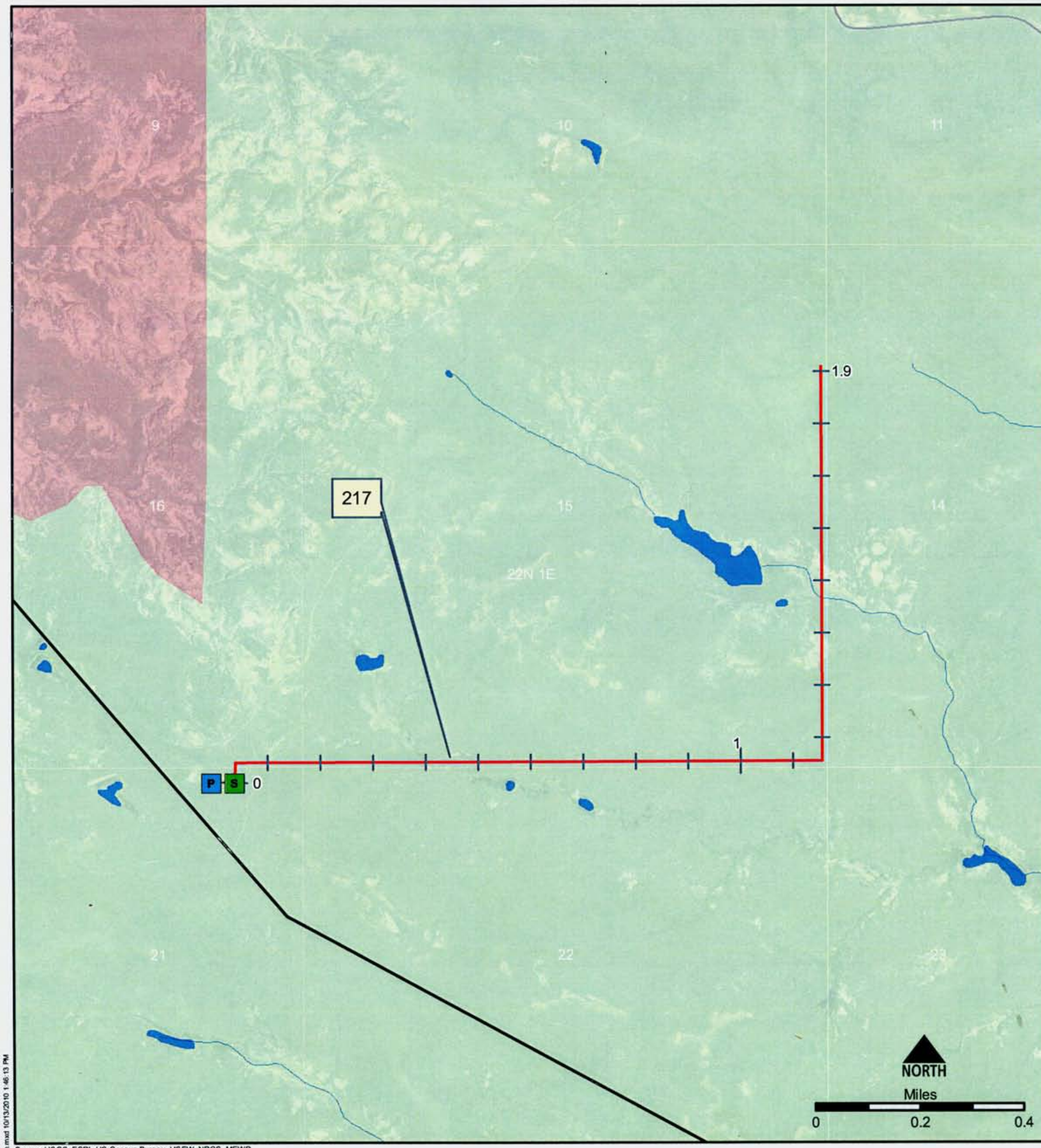
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_217_Jurisdiction.mxd 10/13/2010 1:51:40 PM

P Pumping Station-15
S Proposed Substation
New Distribution Line Construction
Proposed Keystone Pipeline
Roads
Streams
BLM
State
Private

PS 15
Service Area
Jurisdiction
Project 217

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

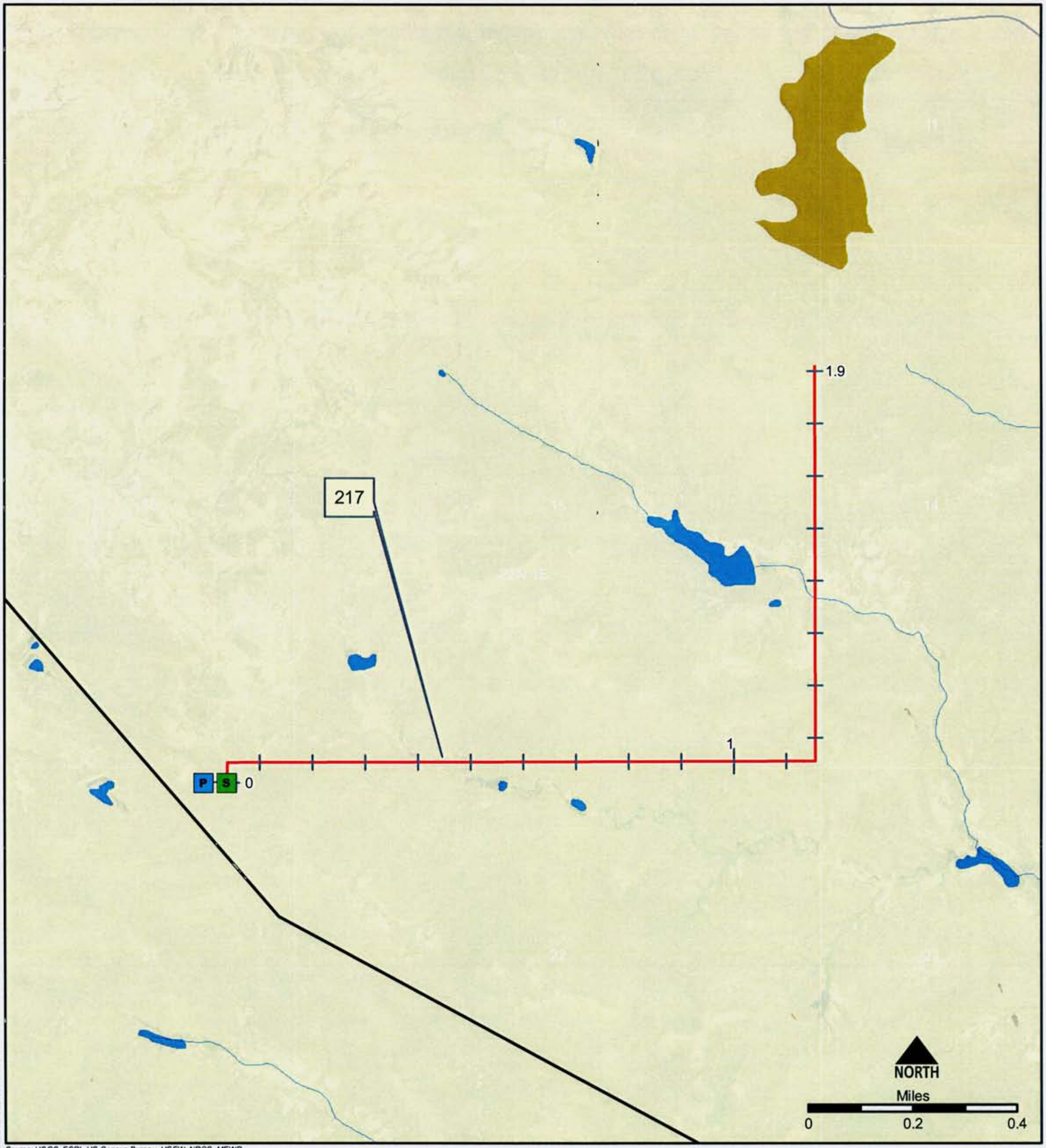
P Pumping Station-15
S Proposed Substation
New Distribution Line Construction
Proposed Keystone Pipeline
Roads
Streams
Herbaceous Rangeland
Mixed Rangeland

PS 15
Service Area
Land Use
Project 217

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI Engineering with Distinction
ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS15_217_LandUse.mxd 10/13/2010 1:46:13 PM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

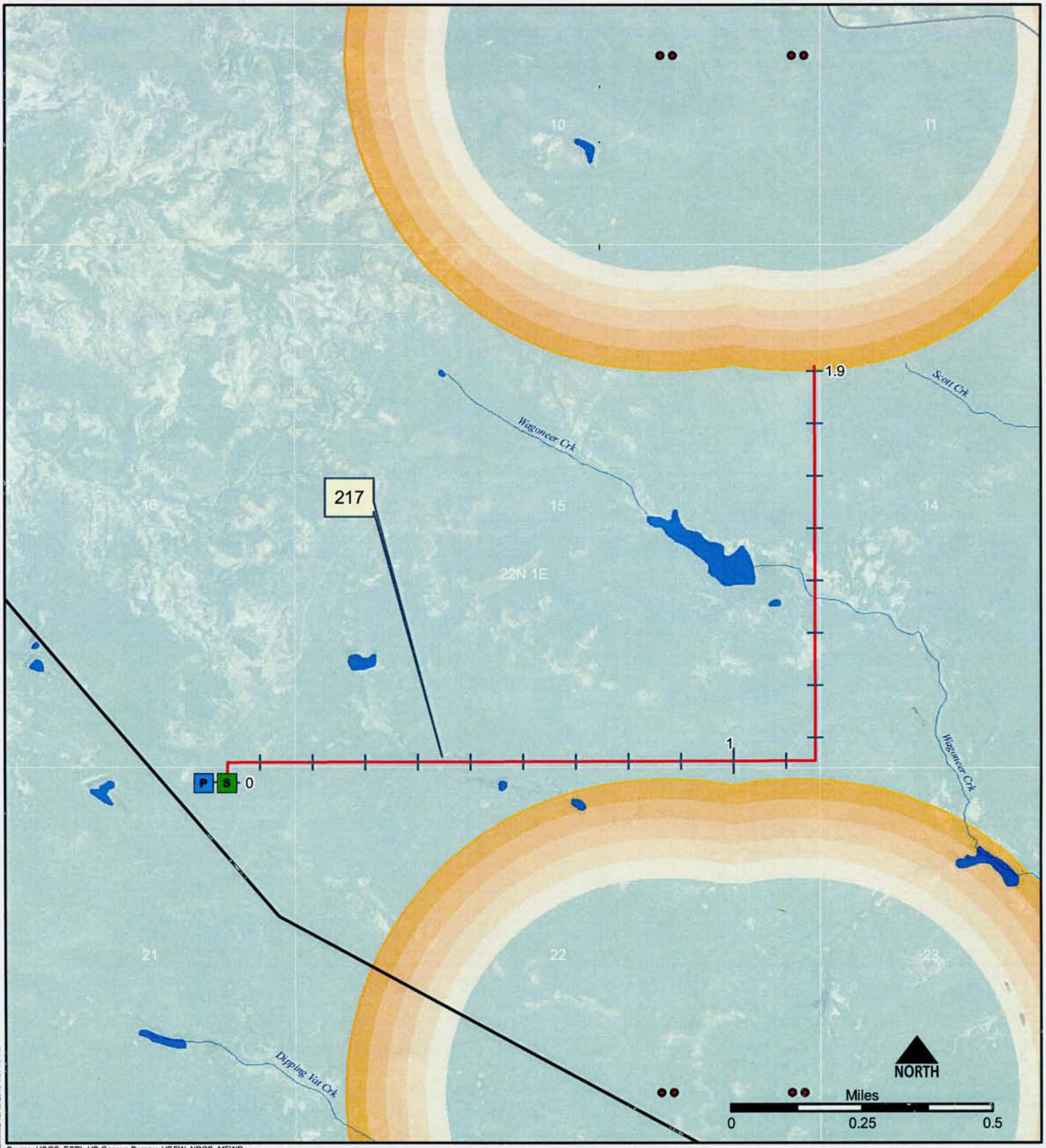
- P Pumping Station-15
- S Proposed Substation
- New Distribution Line Construction
- Proposed Keystone Pipeline
- Roads
- Streams
- Farmland of statewide importance
- Non-prime farmland

PS 15
Service Area
Prime Farmland
Project 217

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_217_LandUse.mxd 10/13/2010 1:46:13 PM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_217_Jurisdiction.mxd 10/13/2010 1:51:40 PM

P Pumping Station-15
S Proposed Substation
New Distribution Line Construction
Proposed Keystone Pipeline
Roads
Streams
Sage Grouse Survey Points
.6 mile No Build Buffer
3 mile Restricted Building Buffer

PS 15
Service Area
Sage Grouse
Project 217

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ELECTRICAL CONSULTANTS, INC.

Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

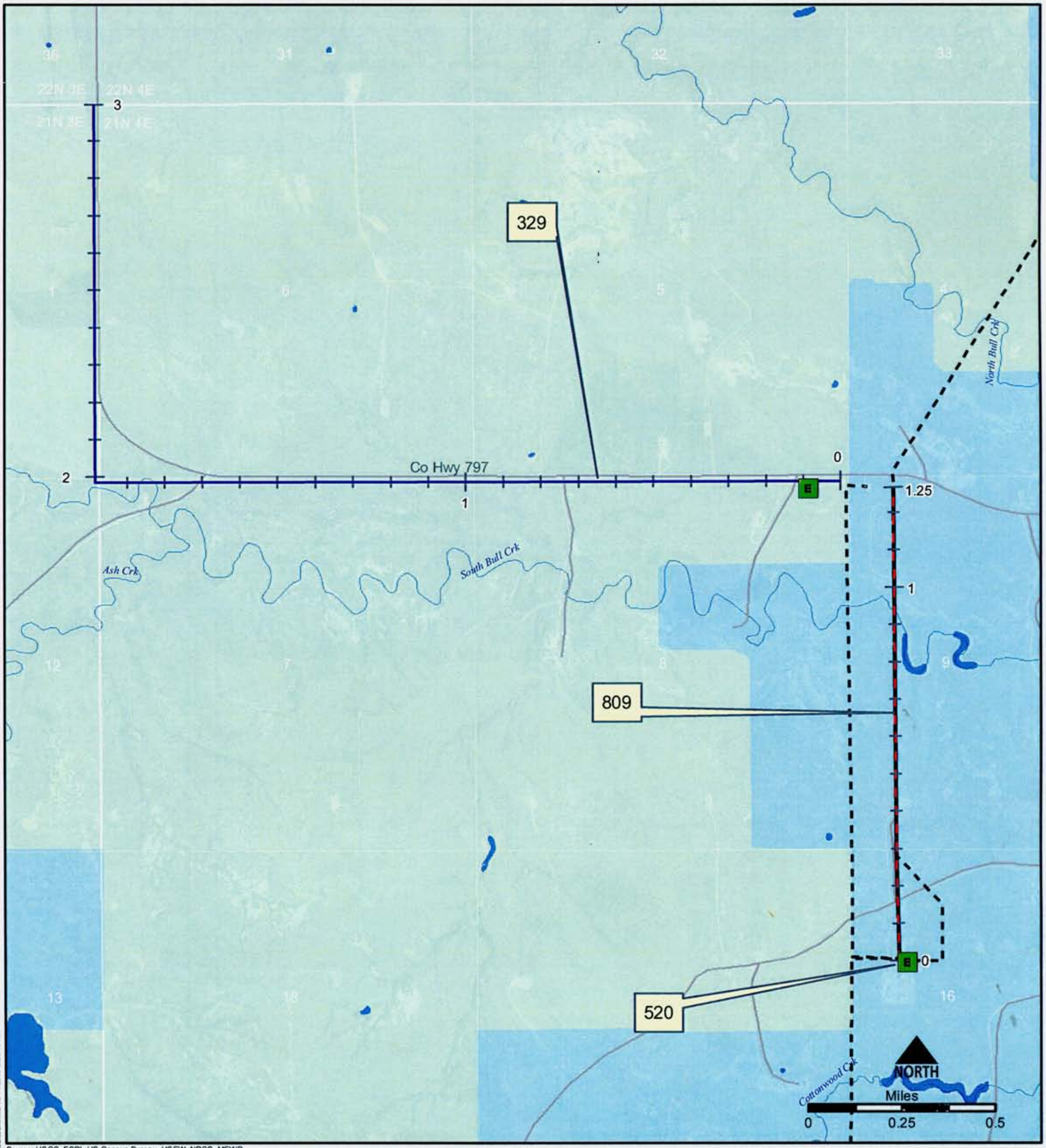
File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS15_217_Jurisdiction.mxd 10/13/2010 1:51:40 PM

P Pumping Station-15
S Proposed Substation
New Distribution Line Construction
Proposed Keystone Pipeline
Roads
Streams
Wetlands

PS 15
Service Area
Wetlands
Project 217

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

E Existing Substations
Rebuild Transmission Line
Rebuild Distribution Line
Existing Transmission Lines

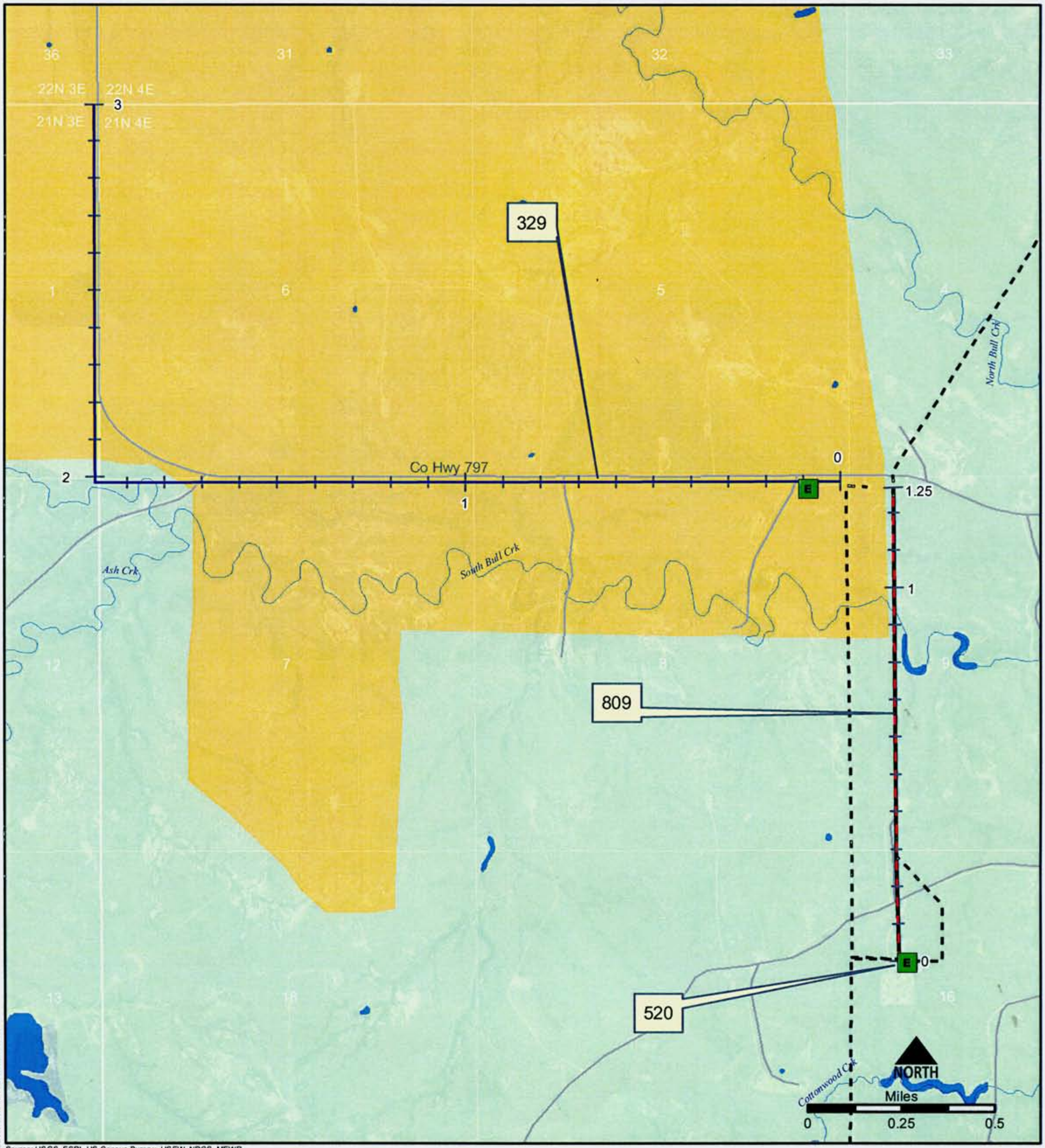
Roads
Streams
BLM
State
Private

PS 15
Service Area
Jurisdiction
Projects 329, 809, 520

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI "Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9601 Keystone\GIS\MXD\ER_PS15_329_809_Jurisdiction.mxd 10/14/2010 8:29:10 AM



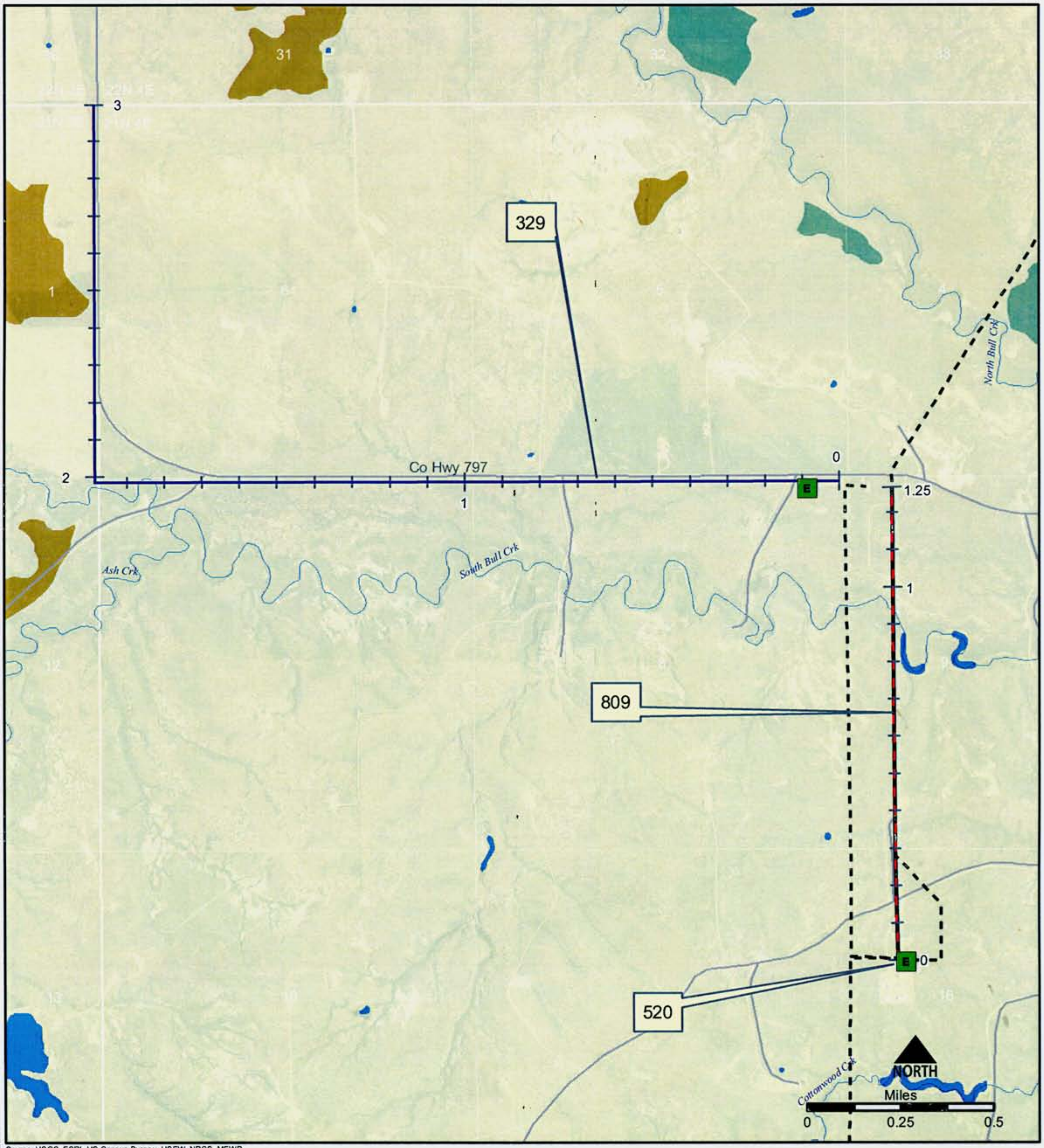
Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

- Existing Substations
- Rebuild Distribution Line
- Rebuild Transmission Line
- Existing Transmission Lines
- Roads
- Streams
- Cropland and Pasture
- Herbaceous Rangeland

PS 15
Service Area
Land Use
Projects 329, 809, 520

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

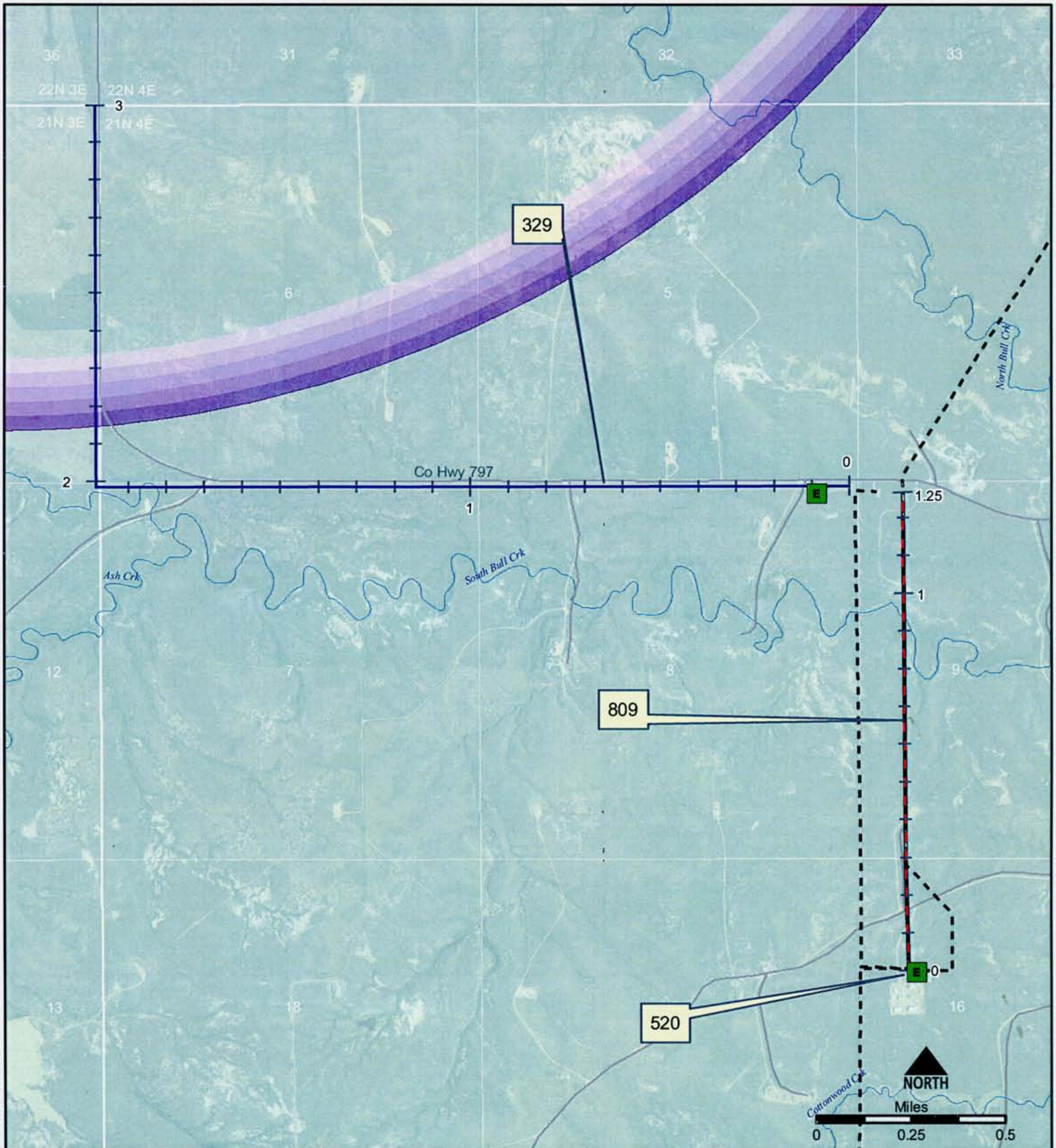
- Existing Substations
- Rebuild Distribution Line
- Rebuild Transmission Line
- Existing Transmission Lines
- Roads
- Streams
- All areas are prime farmland
- Farmland of statewide importance
- Non-prime farmland
- Prime farmland if irrigated

PS 15
Service Area
Prime Farmland
Projects 329, 809, 520

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_329_809_Jurisdiction.mxd 10/14/2010 8:29:10 AM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

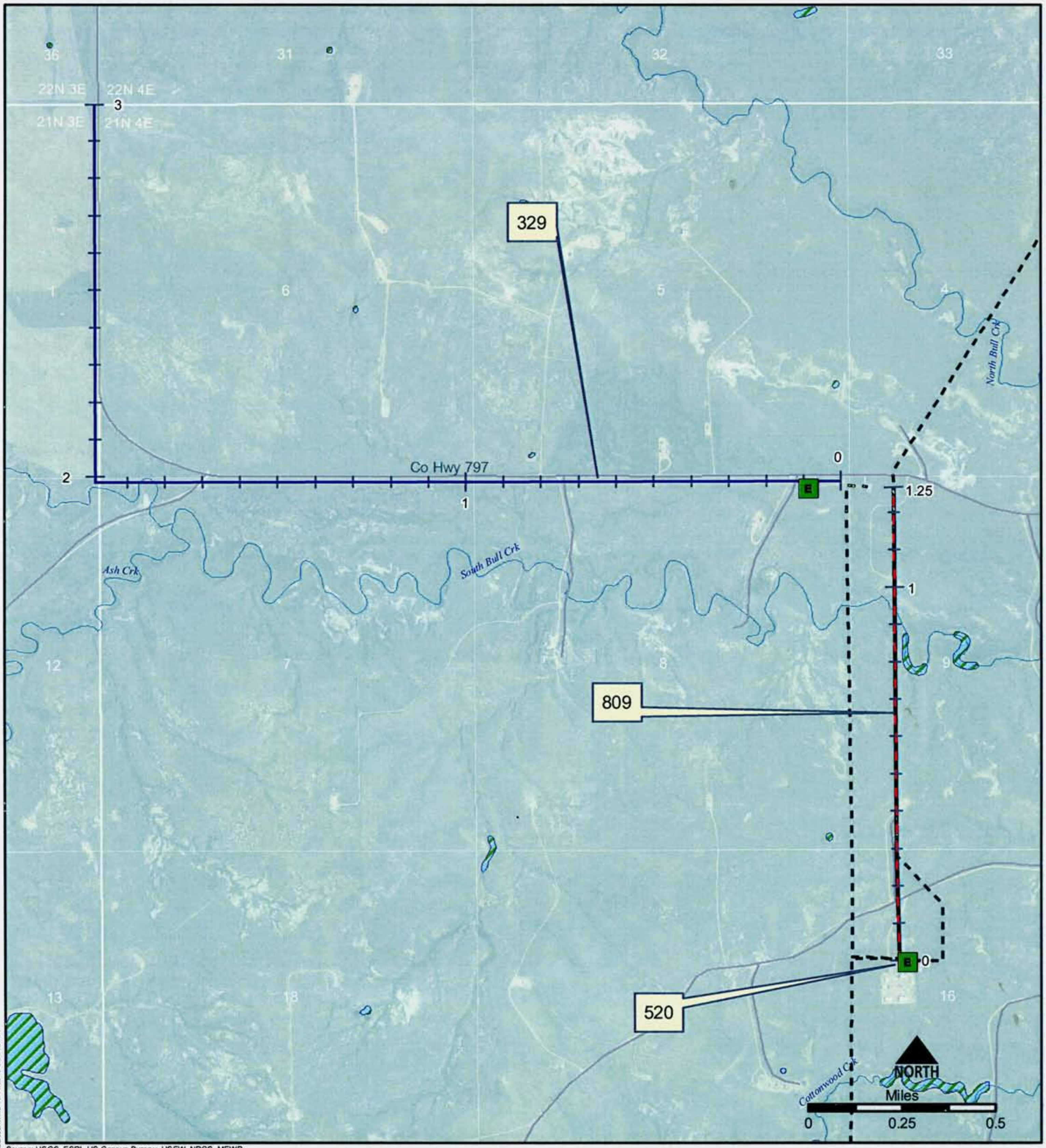
Existing Substations
Rebuild Distribution Line
Rebuild Transmission Line
Existing Transmission Lines
Roads
Streams
Sage Grouse Survey Points
.6 mile No Build Buffer
3 mile Restricted Building Buffer

PS 15
Service Area
Sage Grouse
Projects 329, 809, 520

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_329_809_Jurisdiction.mxd 10/14/2010 9:28:52 AM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

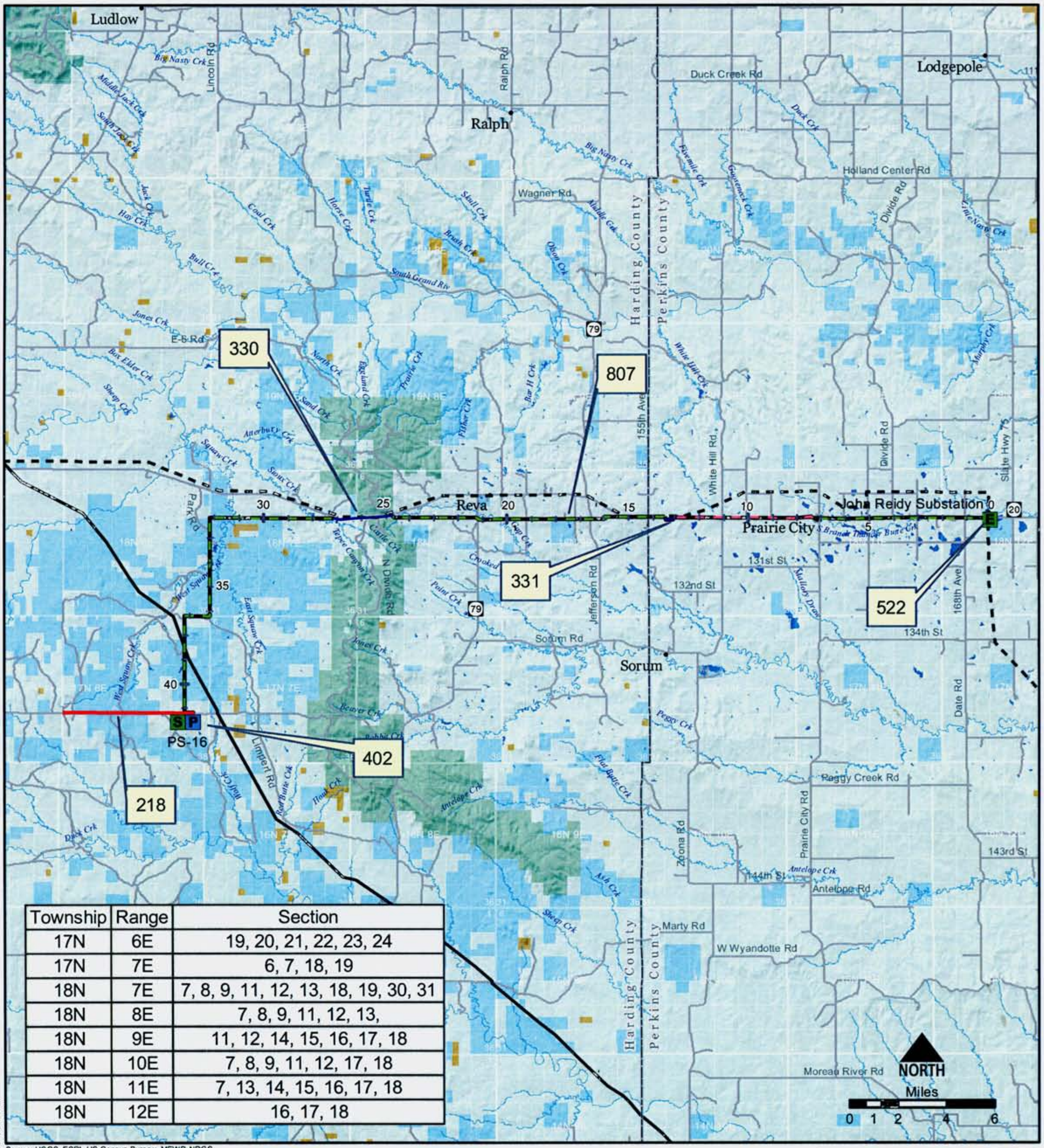
E Existing Substations
Rebuild Distribution Line
Rebuild Transmission Line
Existing Transmission Lines
Roads
Streams
Wetlands

PS 15
Service Area
Wetlands
Projects 329, 809, 520

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS15_329_809_Jurisdiction.mxd 10/14/2010 9:28:52 AM



Township	Range	Section
17N	6E	19, 20, 21, 22, 23, 24
17N	7E	6, 7, 18, 19
18N	7E	7, 8, 9, 11, 12, 13, 18, 19, 30, 31
18N	8E	7, 8, 9, 11, 12, 13,
18N	9E	11, 12, 14, 15, 16, 17, 18
18N	10E	7, 8, 9, 11, 12, 17, 18
18N	11E	7, 13, 14, 15, 16, 17, 18
18N	12E	16, 17, 18

Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

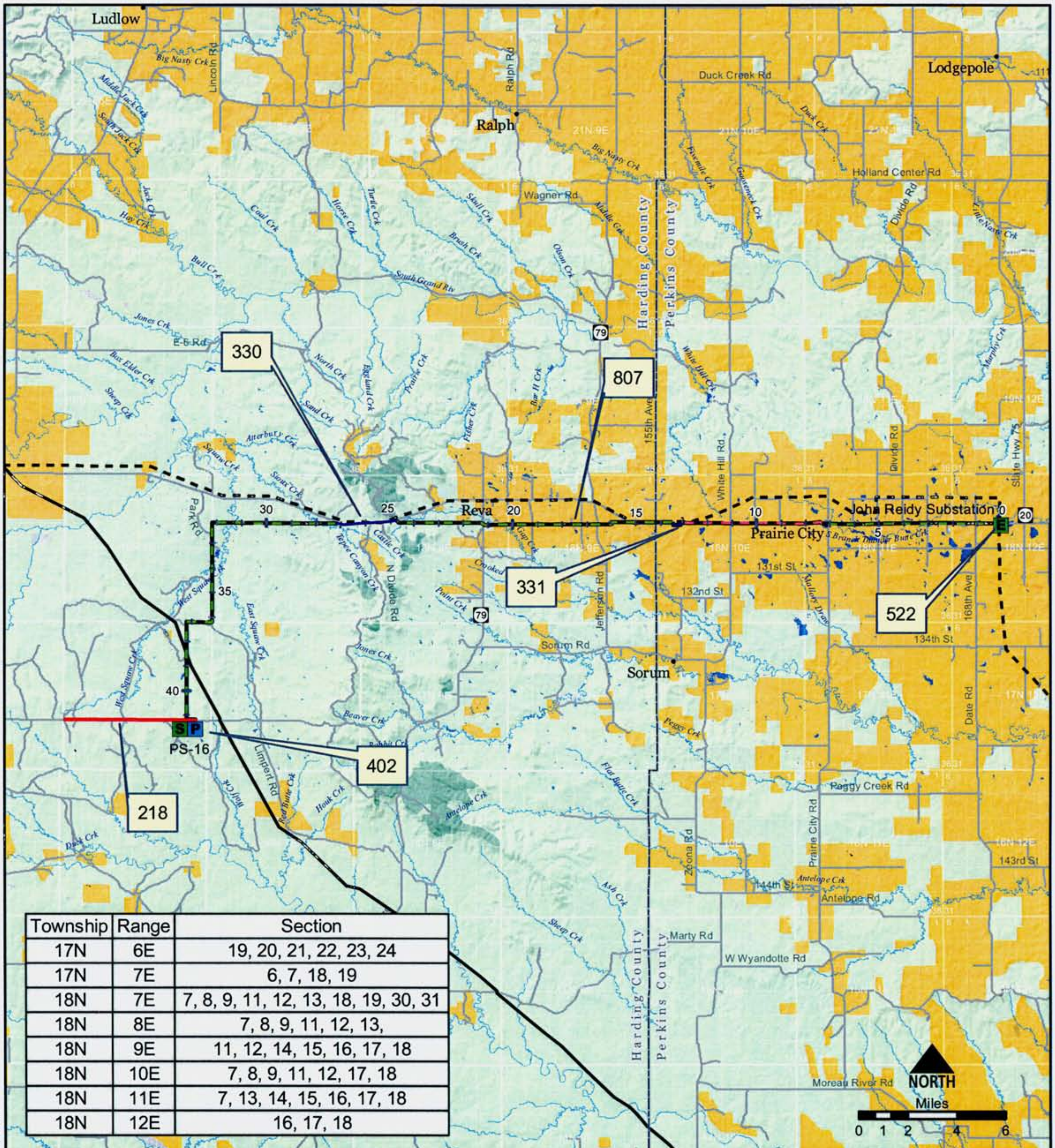
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16.mxd 10/14/2010 10:23:23 AM

P Pumping Station-16
S Proposed Substation
E Existing Substation
New Transmission Line
Underbuilt Section
Rebuild Distribution Line
New Distribution Line
Existing Transmission Line
Proposed Keystone Pipeline
Roads
Streams
BLM
USFS
State
Private

PS 16
Service Area
Jurisdiction

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

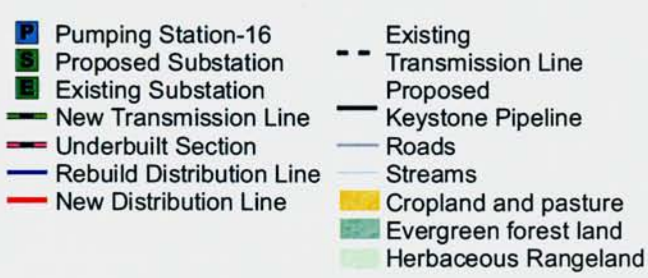
ECI ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
17N	6E	19, 20, 21, 22, 23, 24
17N	7E	6, 7, 18, 19
18N	7E	7, 8, 9, 11, 12, 13, 18, 19, 30, 31
18N	8E	7, 8, 9, 11, 12, 13,
18N	9E	11, 12, 14, 15, 16, 17, 18
18N	10E	7, 8, 9, 11, 12, 17, 18
18N	11E	7, 13, 14, 15, 16, 17, 18
18N	12E	16, 17, 18

Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

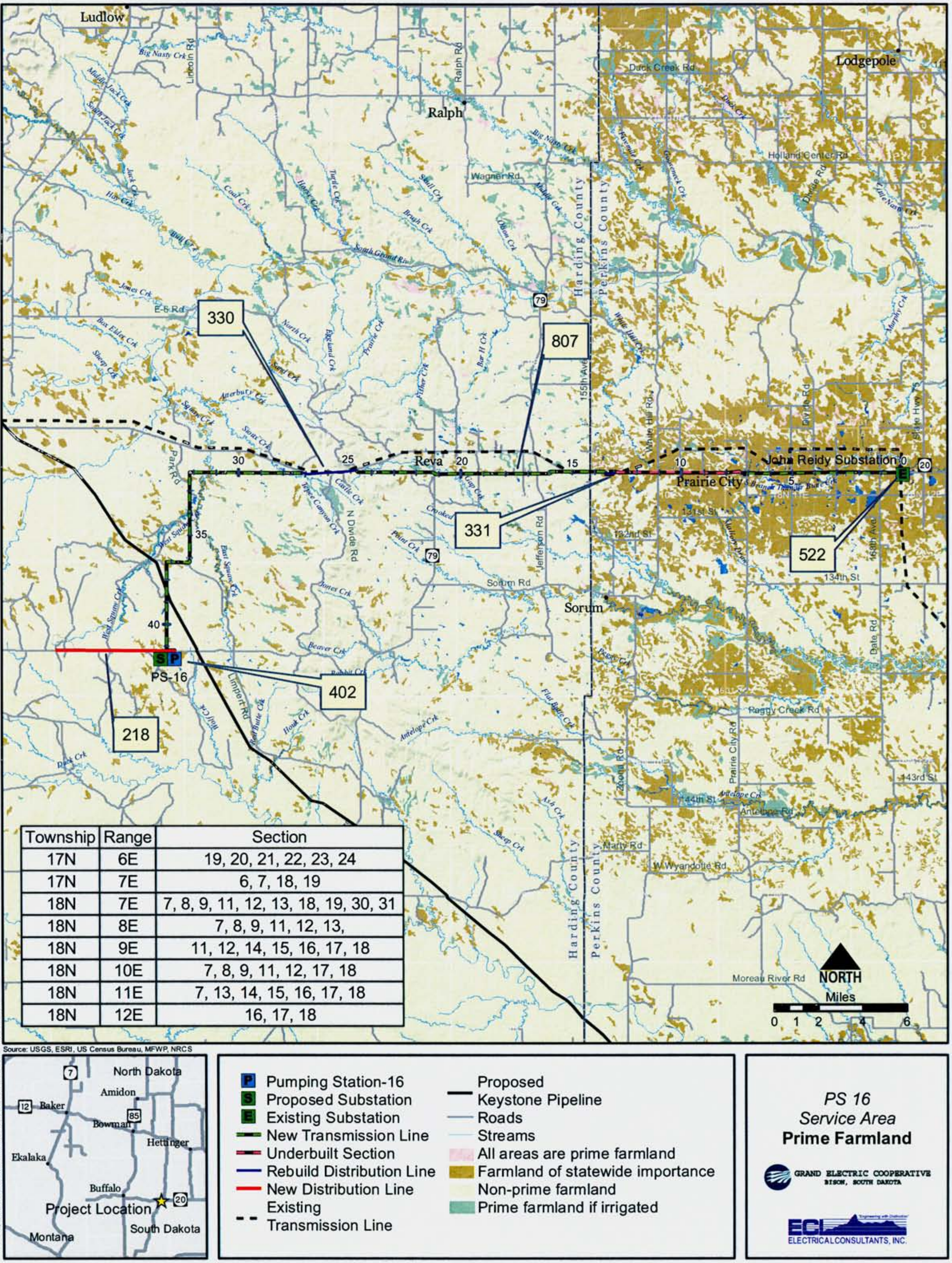
File: R:\Projects\540-5501 Keystone\GIS\MXD\ER_PS16.mxd 10/14/2010 10:23:23 AM



PS 16
Service Area
Land Use

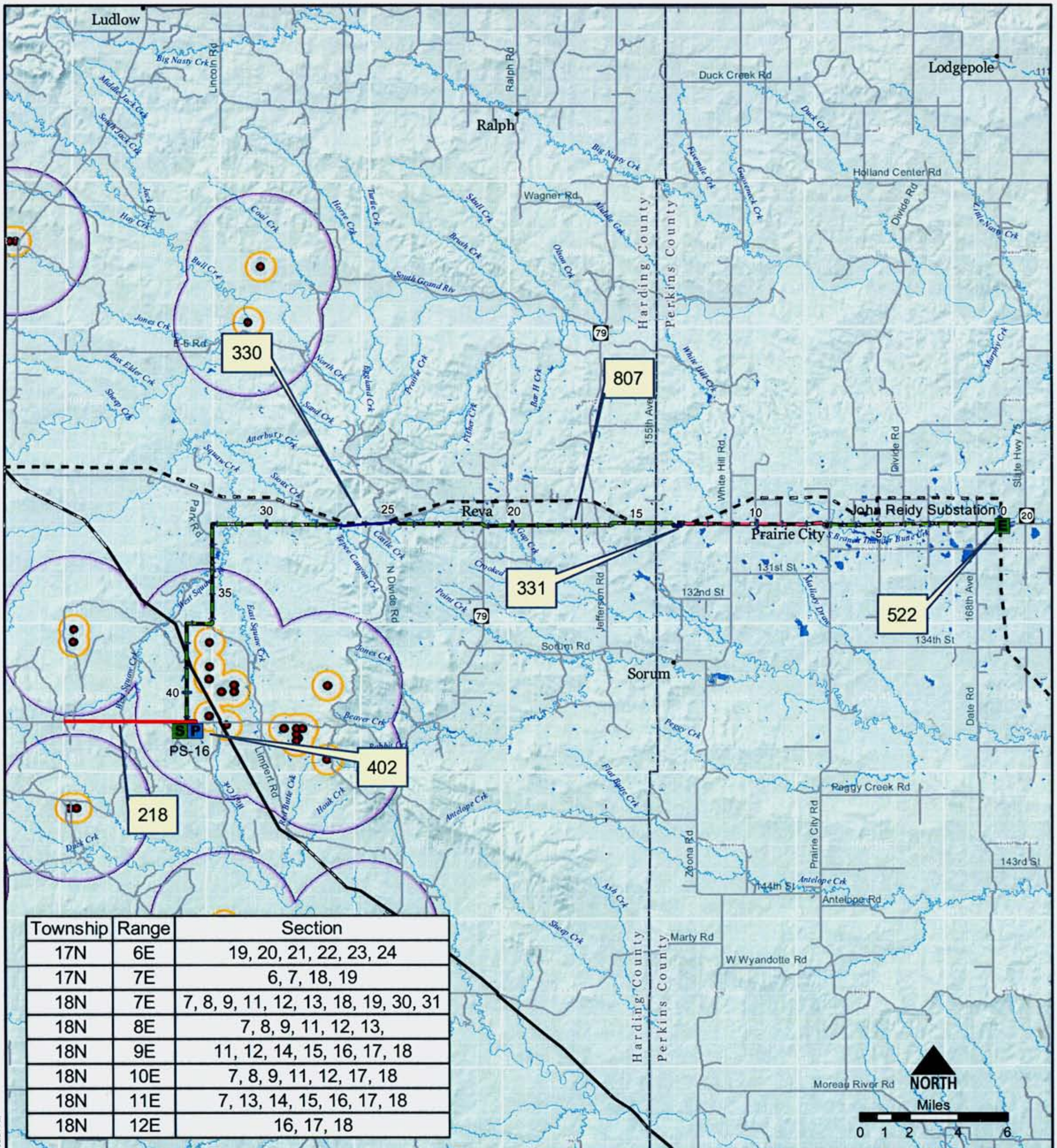
GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
17N	6E	19, 20, 21, 22, 23, 24
17N	7E	6, 7, 18, 19
18N	7E	7, 8, 9, 11, 12, 13, 18, 19, 30, 31
18N	8E	7, 8, 9, 11, 12, 13,
18N	9E	11, 12, 14, 15, 16, 17, 18
18N	10E	7, 8, 9, 11, 12, 17, 18
18N	11E	7, 13, 14, 15, 16, 17, 18
18N	12E	16, 17, 18

PS 16
Service Area
Prime Farmland



Township	Range	Section
17N	6E	19, 20, 21, 22, 23, 24
17N	7E	6, 7, 18, 19
18N	7E	7, 8, 9, 11, 12, 13, 18, 19, 30, 31
18N	8E	7, 8, 9, 11, 12, 13,
18N	9E	11, 12, 14, 15, 16, 17, 18
18N	10E	7, 8, 9, 11, 12, 17, 18
18N	11E	7, 13, 14, 15, 16, 17, 18
18N	12E	16, 17, 18

Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

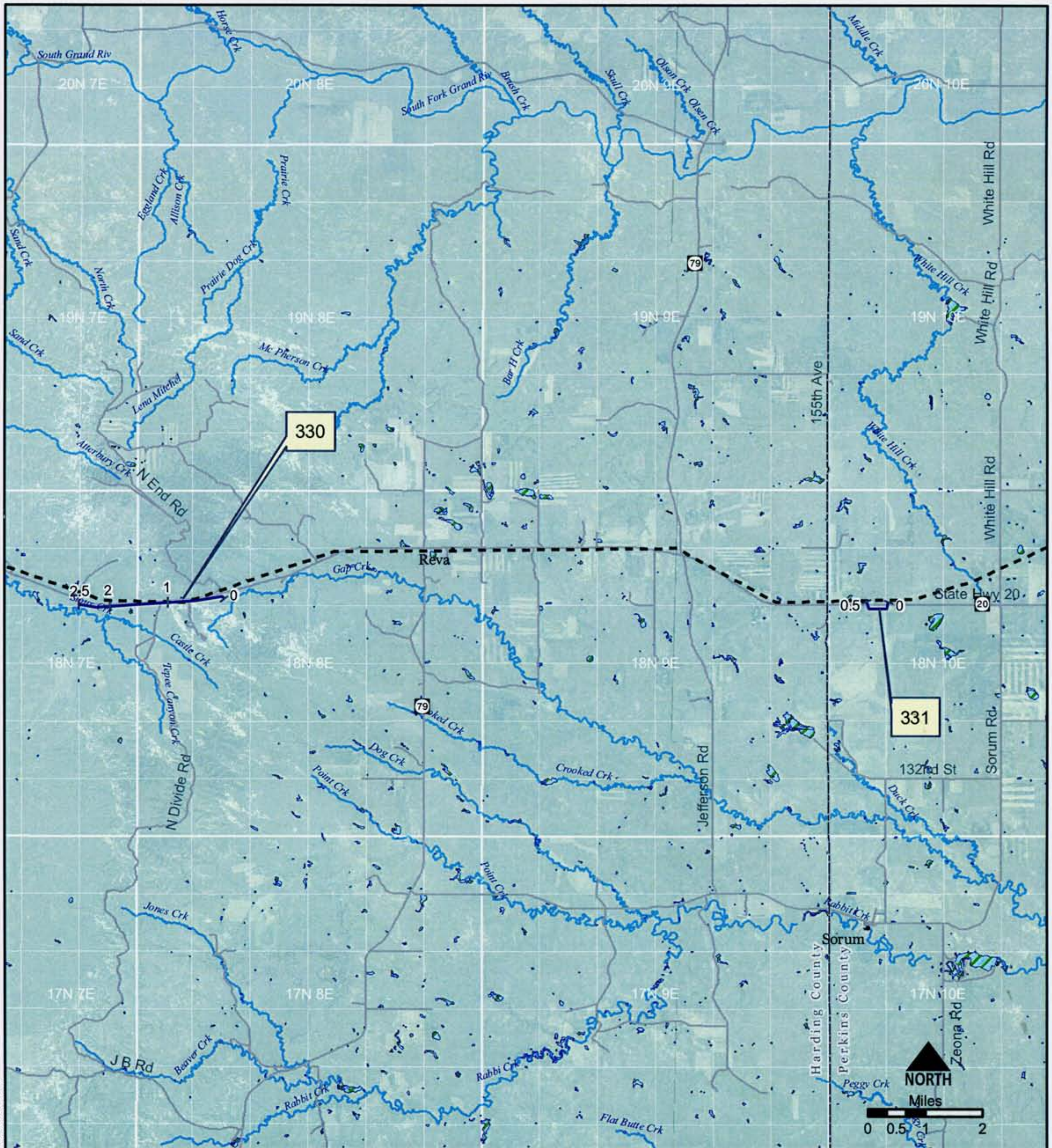
File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS16.mxd 10/13/2010 1:05:31 PM

- P Pumping Station-16
- S Proposed Substation
- E Existing Substation
- New Transmission Line
- Underbuilt Section
- Rebuild Distribution Line
- New Distribution Line
- Existing Transmission Line
- Proposed Keystone Pipeline
- Roads
- Streams
- Sage Grouse Survey Points
- .6 mile No Build Buffer
- 3 mile Restricted Building Buffer

PS 16
Service Area
Sage Grouse

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

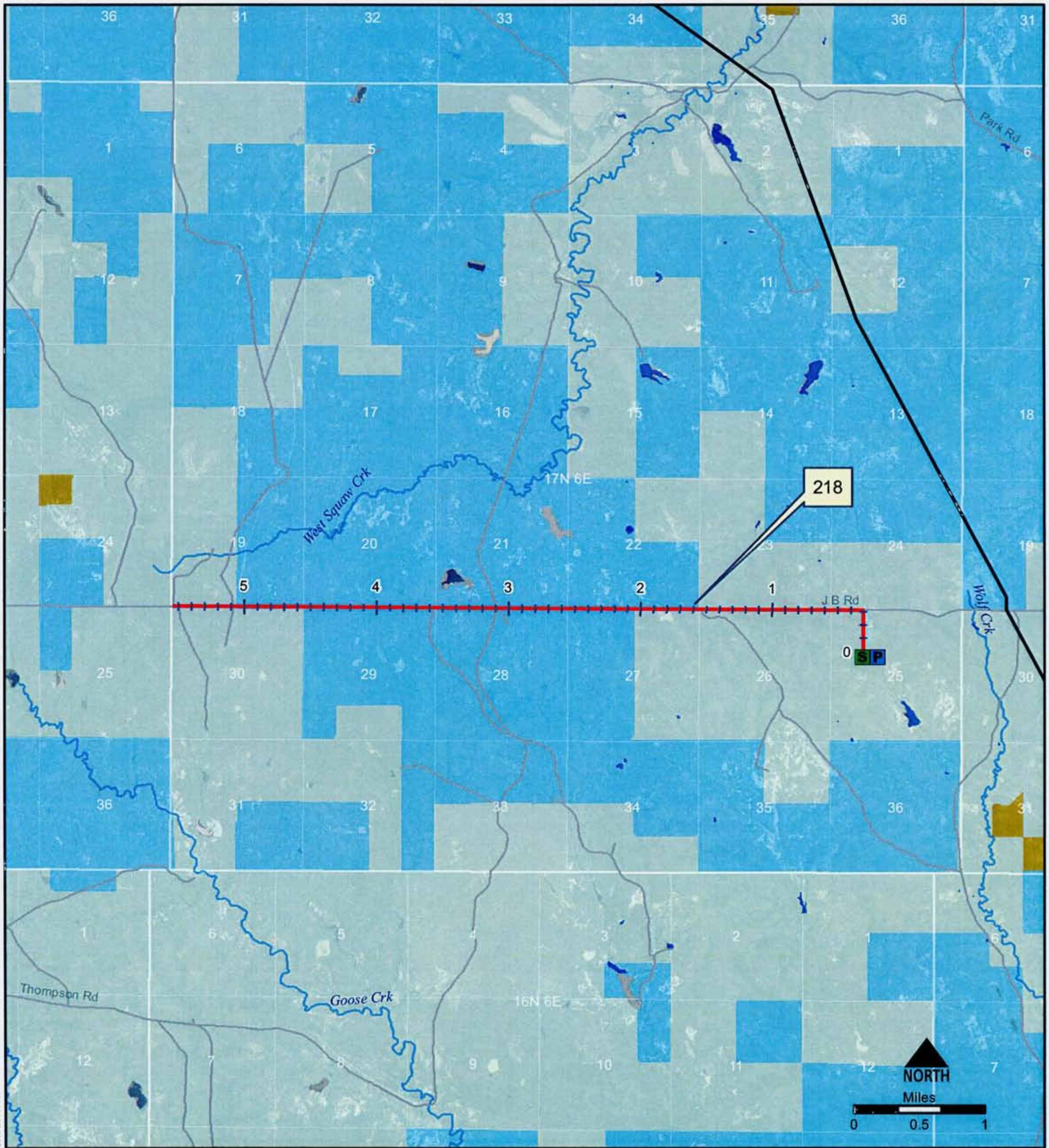
File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS16_330_331.mxd 10/13/2010 3:44:05 PM

Rebuild Distribution Line
Existing Transmission Line
Roads
Streams
Wetlands

PS 16
Service Area
Wetlands
Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

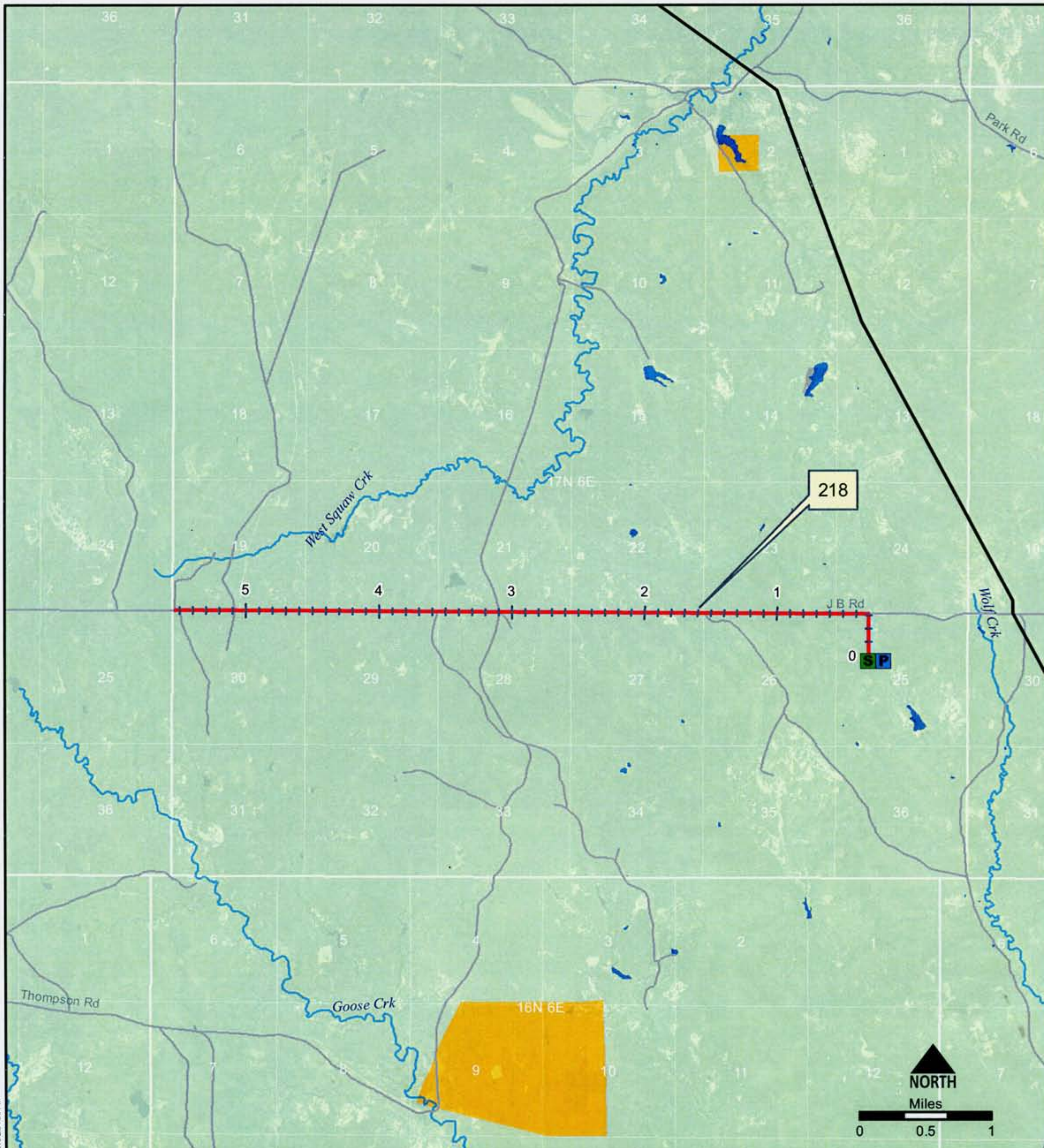
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16_218.mxd 10/13/2010 2:34:30 PM

P Pumping Station-16	Roads
S Proposed Substation	Streams
New Distribution Line Construction	BLM
Proposed Keystone Pipeline	USFS
	State
	Private

PS 16
Service Area
Jurisdiction
Project 218

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

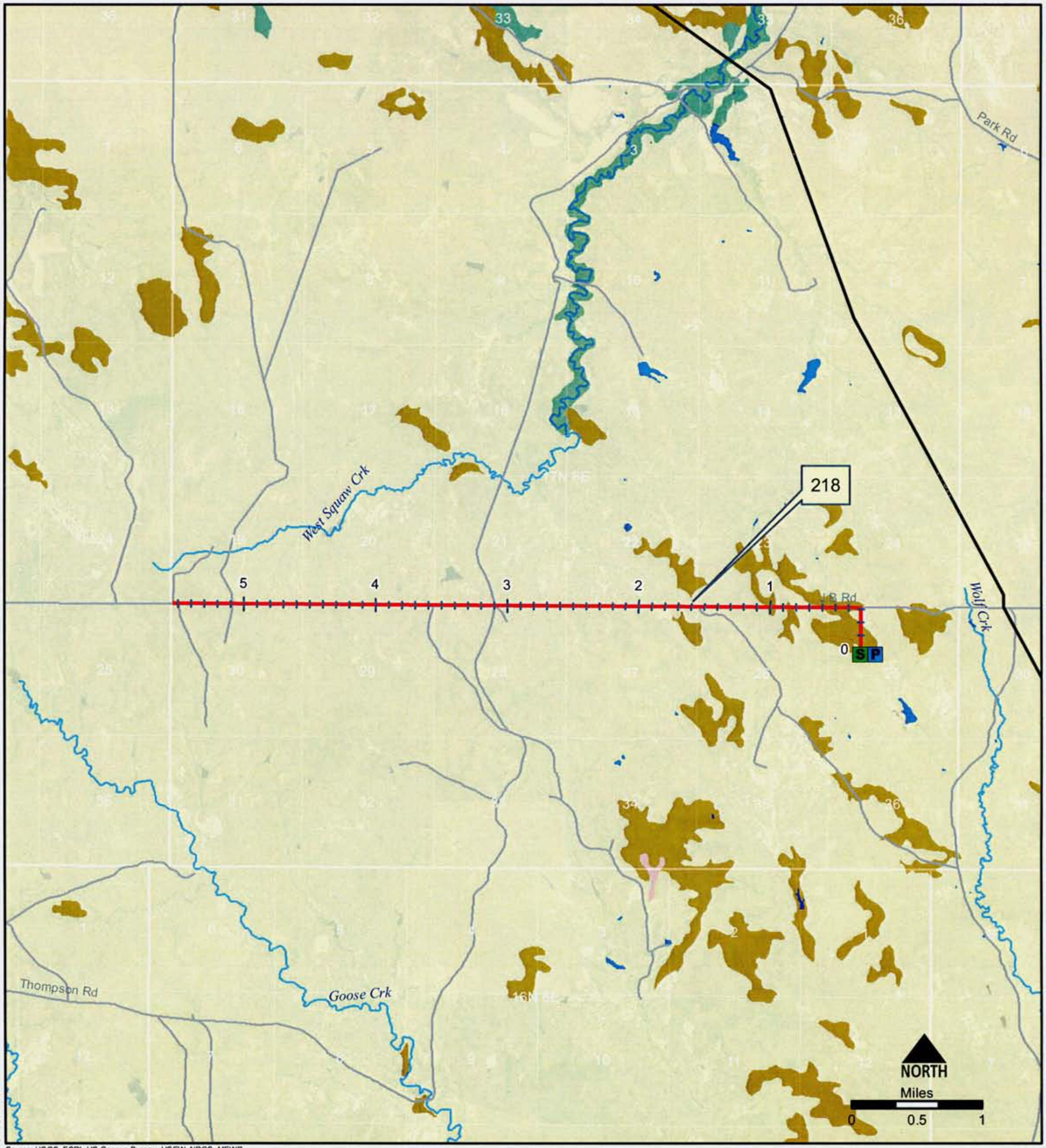
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16_218.mxd 10/13/2010 2:34:30 PM

- P Pumping Station-16
- S Proposed Substation
- New Distribution Line Construction
- Proposed Keystone Pipeline
- Roads
- Streams
- Cropland and pasture
- Evergreen forest land
- Herbaceous Rangeland

PS 16
Service Area
Land Use
Project 218

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

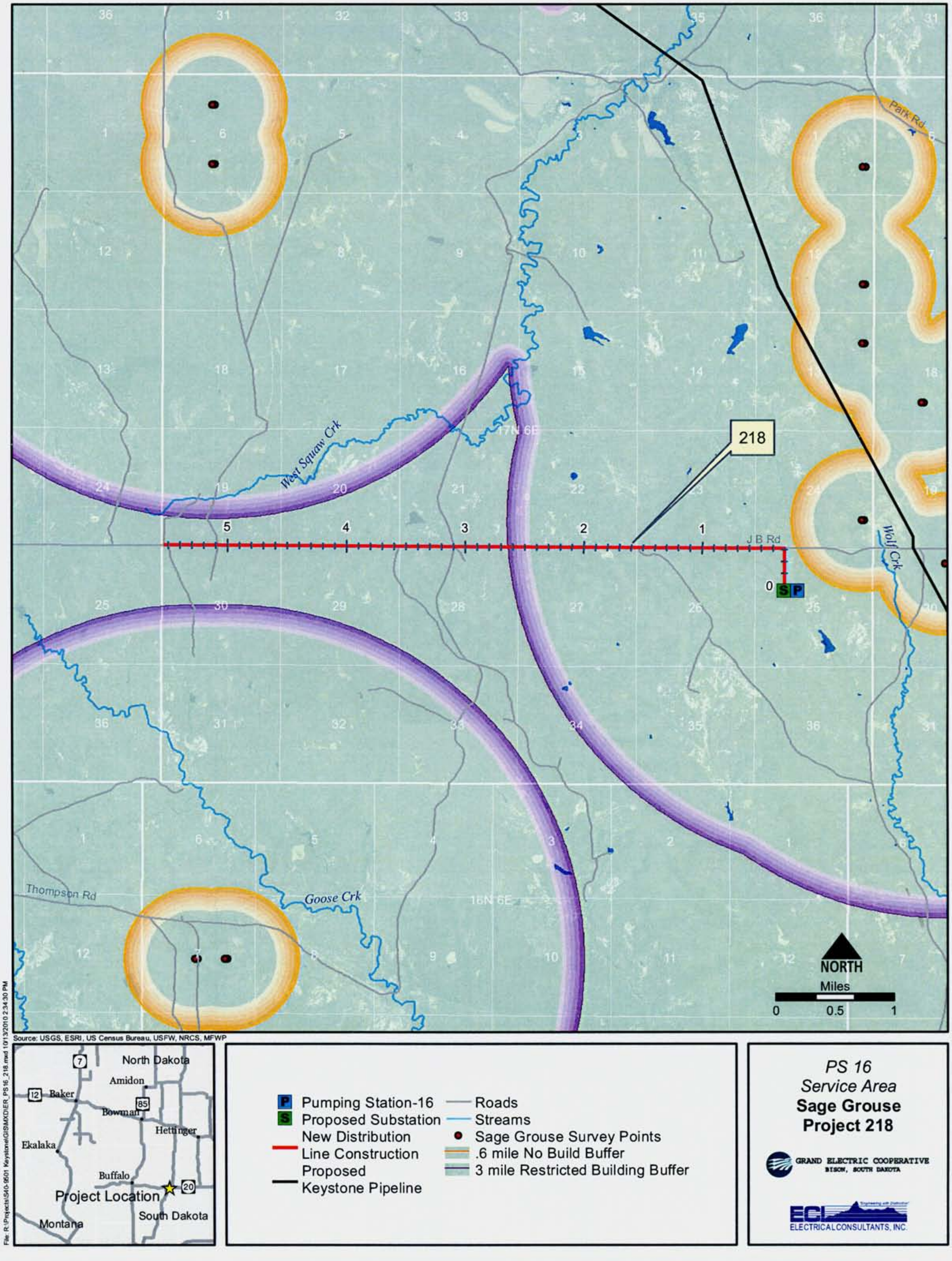
- P Pumping Station-16
- S Proposed Substation
- New Distribution Line Construction
- Proposed Keystone Pipeline
- Roads
- Streams
- All areas are prime farmland
- Farmland of statewide importance
- Non-prime farmland
- Prime farmland if irrigated

PS 16
Service Area
Prime Farmland
Project 218

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.

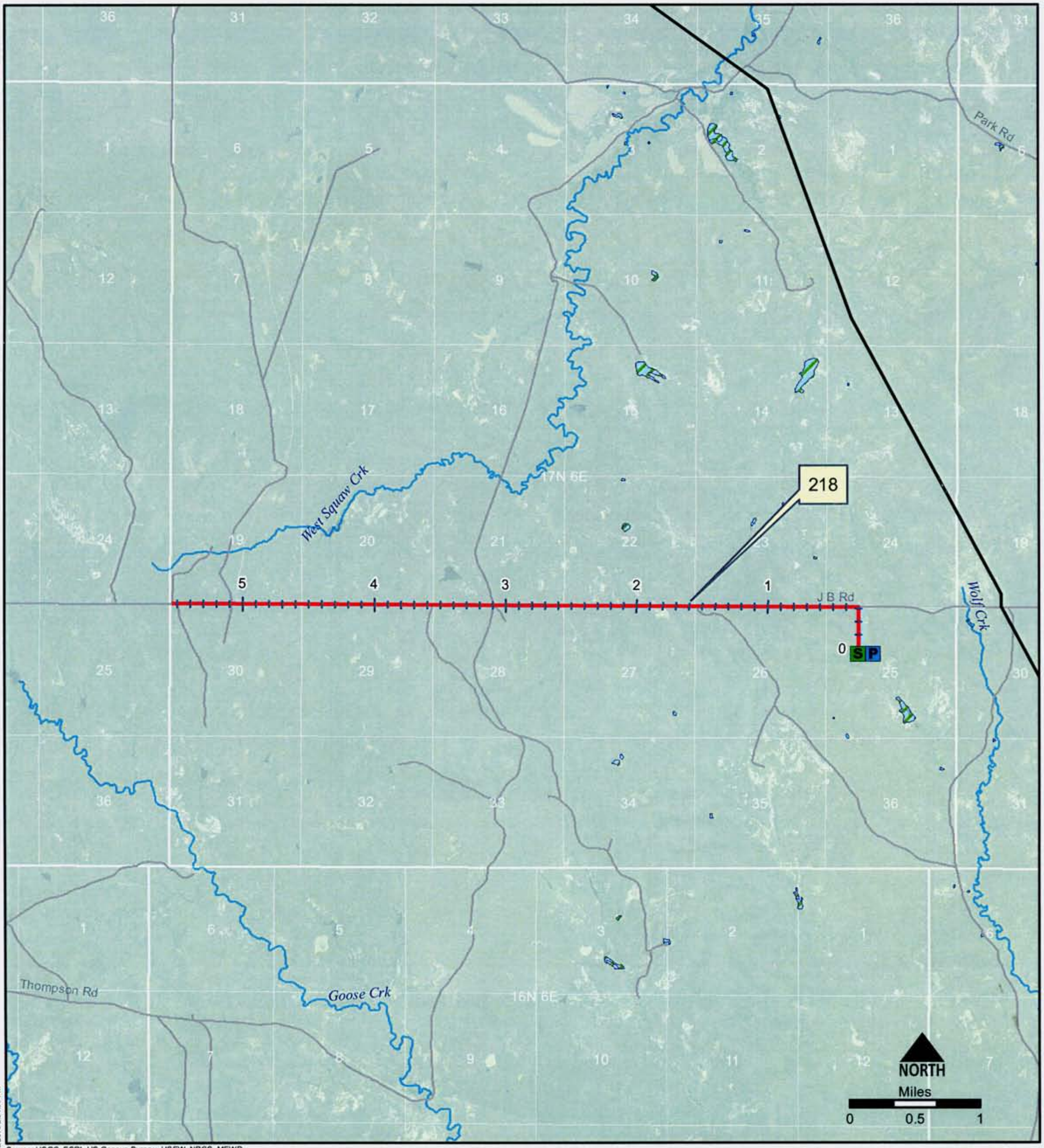
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16_218.mxd 10/13/2010 2:34:30 PM



PS 16
Service Area
Sage Grouse
Project 218

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

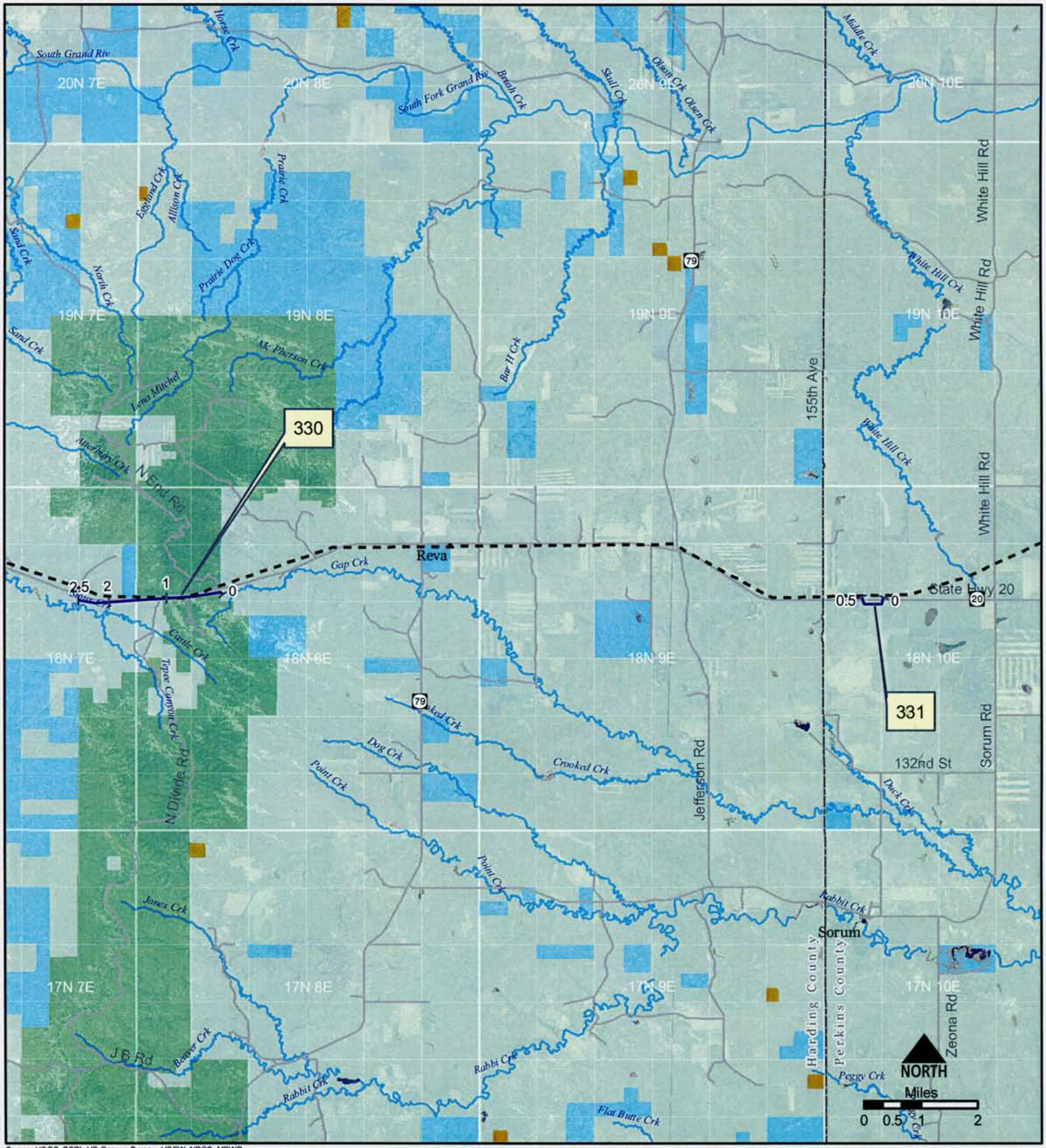
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16_218.mxd 10/13/2010 2:34:30 PM

P Pumping Station-16
S Proposed Substation
New Distribution Line Construction
Proposed Keystone Pipeline
Roads
Streams
Wetlands

PS 16
Service Area
Wetlands
Project 218

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

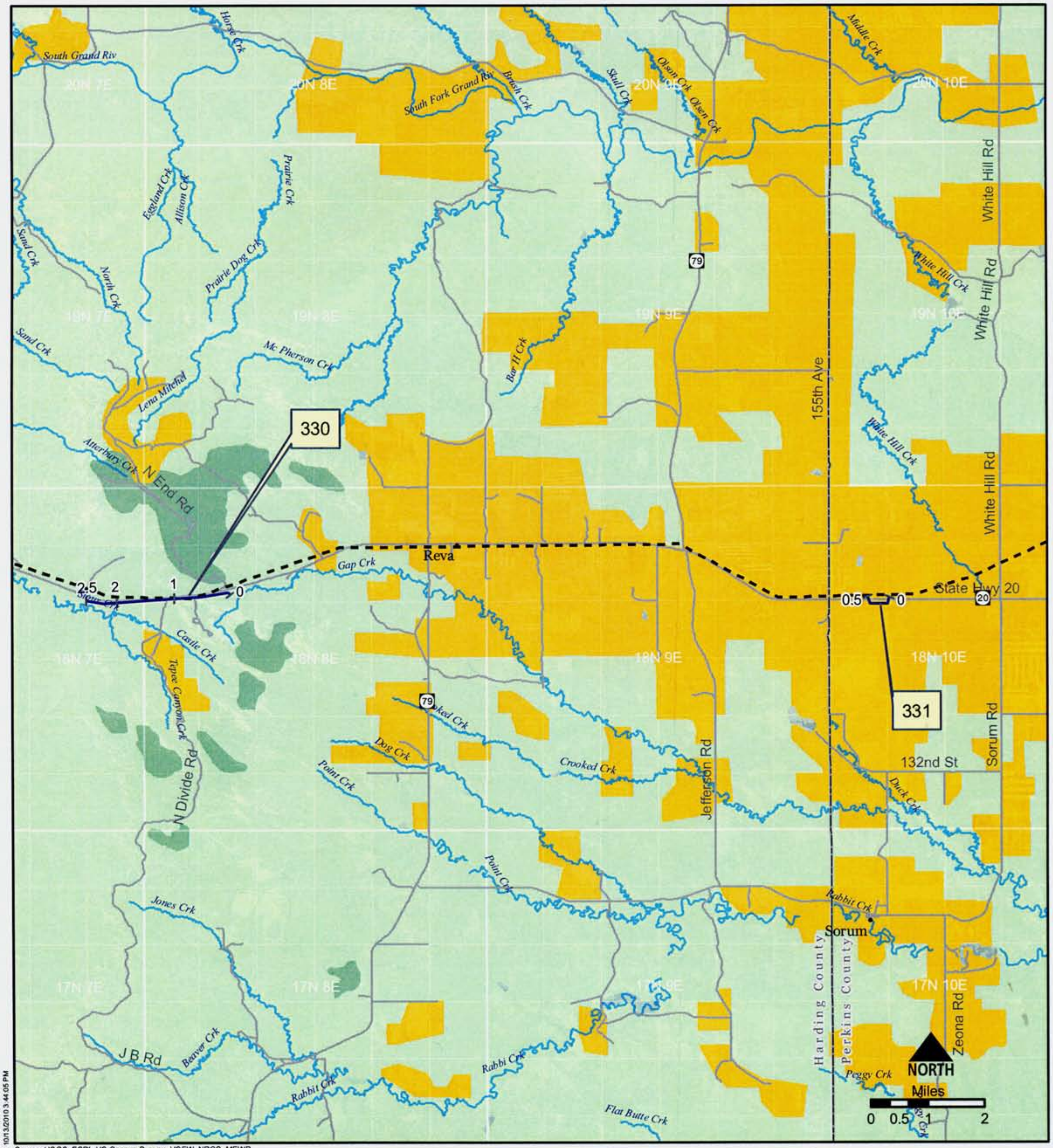
Rebuild Distribution Line
Existing Transmission Line
Roads
Streams
BLM
USFS
State
Private

PS 16
Service Area
Jurisdiction
Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-0601 Keystone\GIS\MXD\ER_PS16_330_331.mxd 10/13/2010 3:44:05 PM



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

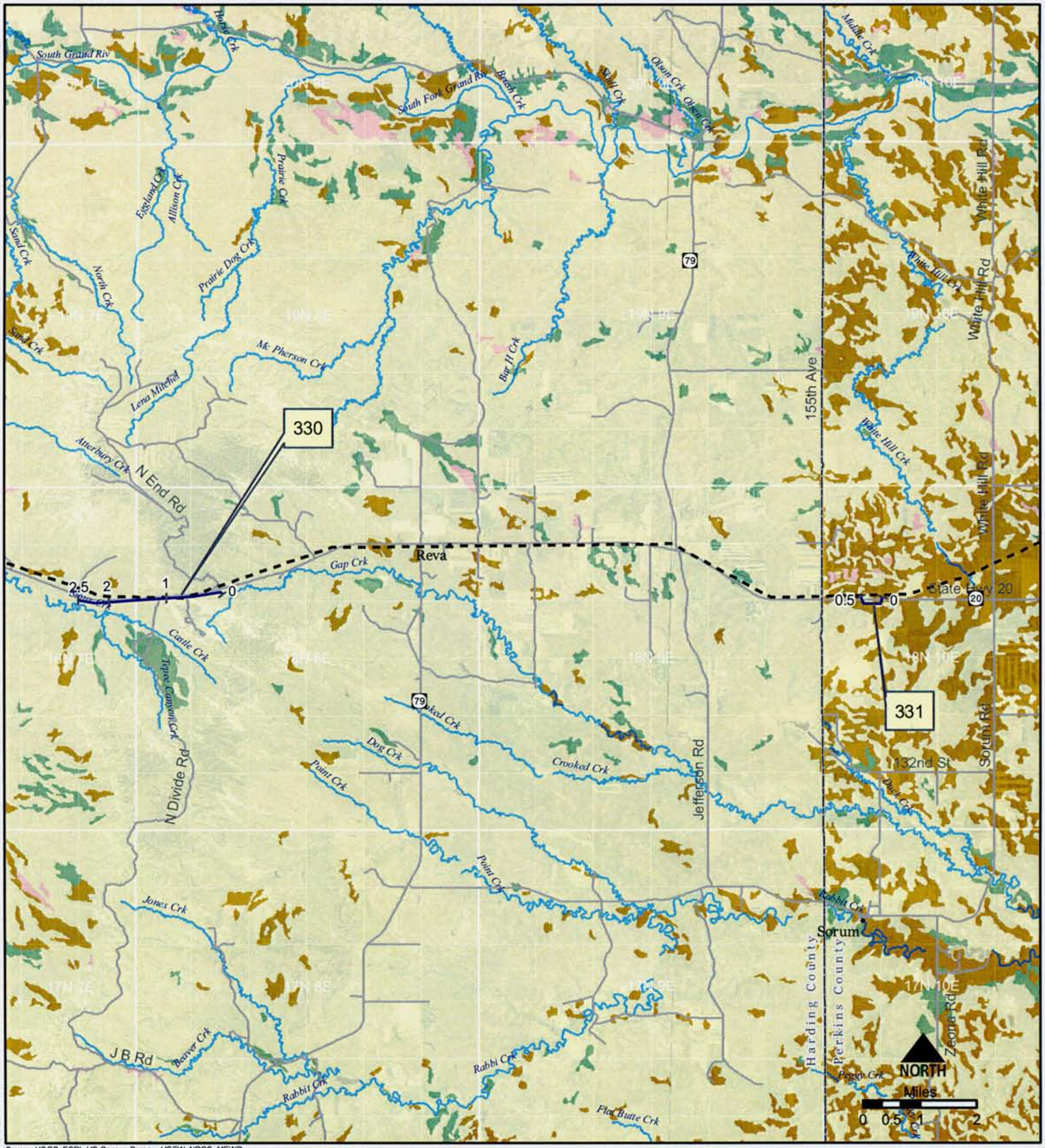
File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS16_330_331.mxd 10/13/2010 3:44:05 PM

Rebuild Distribution Line	Cropland and pasture
Existing Transmission Line	Evergreen forest land
Roads	Herbaceous Rangeland
Streams	

PS 16
Service Area
Land Use
Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



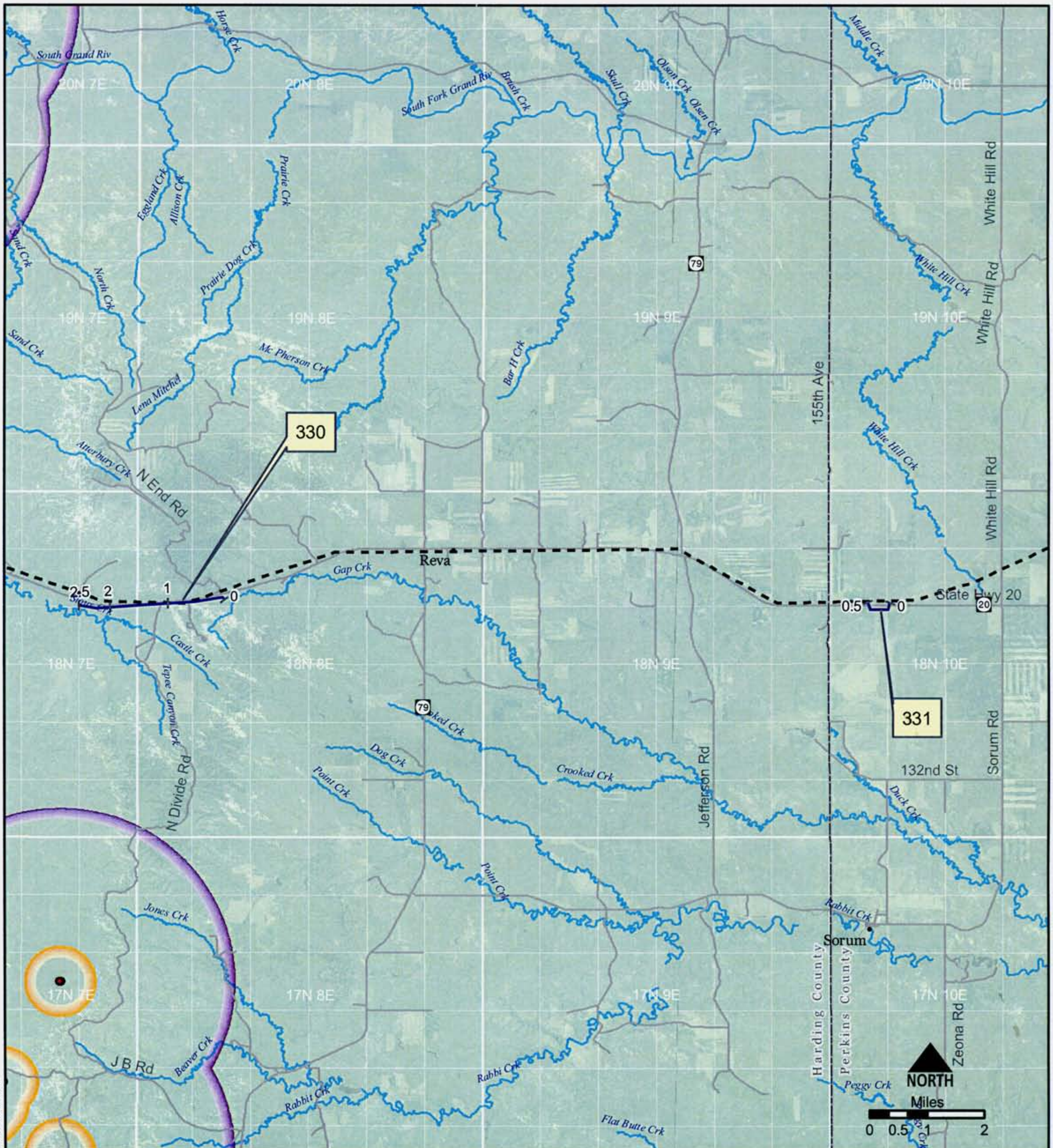
Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

- Rebuild Distribution Line
- Existing Transmission Line
- Roads
- Streams
- All areas are prime farmland
- Farmland of statewide importance
- Non-prime farmland
- Prime farmland if irrigated

PS 16
Service Area
Prime Farmland
Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

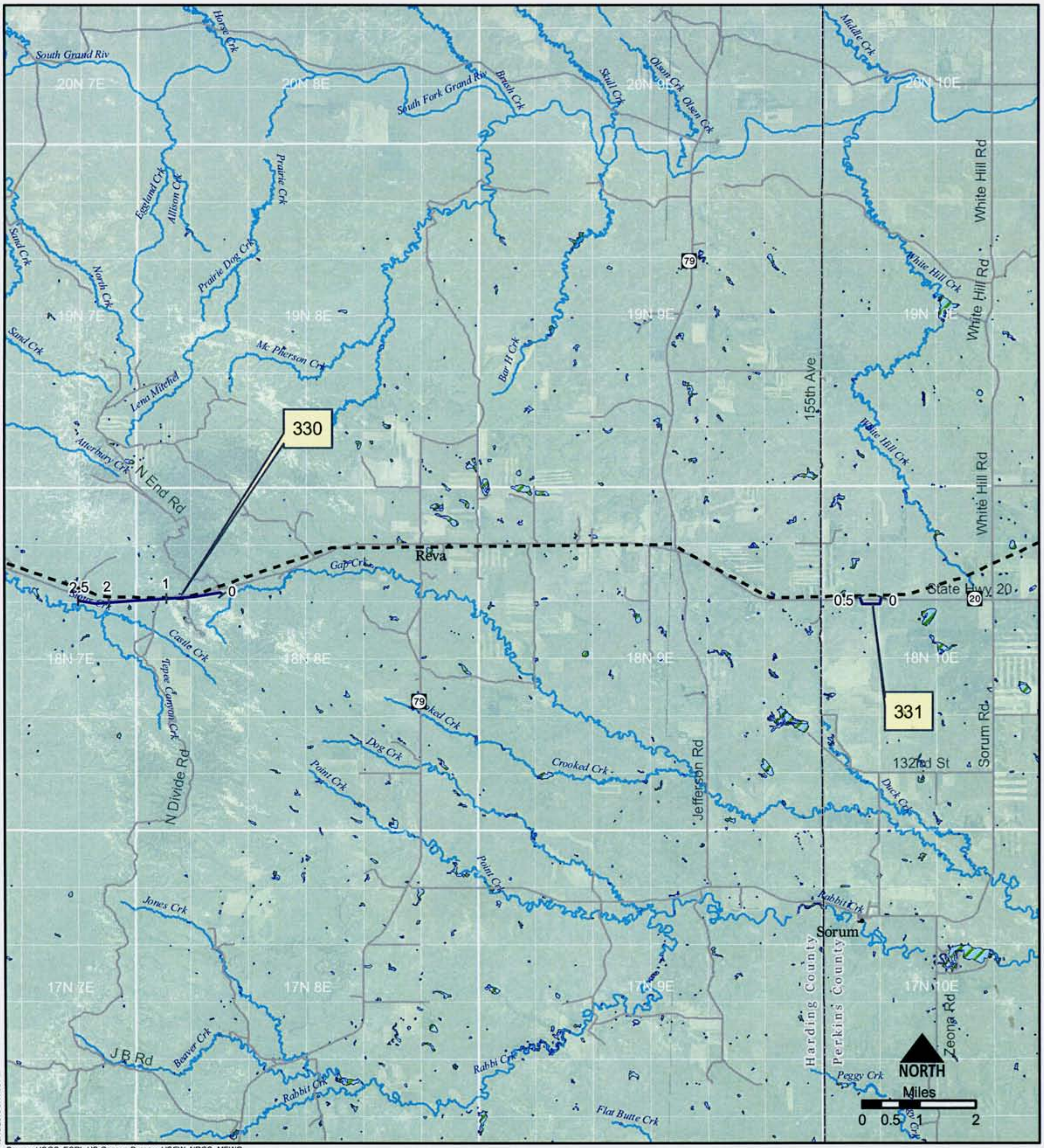
File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS16_330_331.mxd 10/14/2010 9:46:43 AM

- Rebuild Distribution Line
- Existing Transmission Line
- Roads
- Streams
- Sage Grouse Survey Points
- .6 mile No Build Buffer
- 3 mile Restricted Building Buffer

PS 16
Service Area
Sage Grouse
Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, USFW, NRCS, MFWP

File: R:\Projects\540-9601 Keystone\GIS\MXD\ER_PS16_330_331.mxd 10/13/2010 3:44:05 PM

- Rebuild Distribution Line
- Existing Transmission Line
- Roads
- Streams
- Wetlands

PS 16

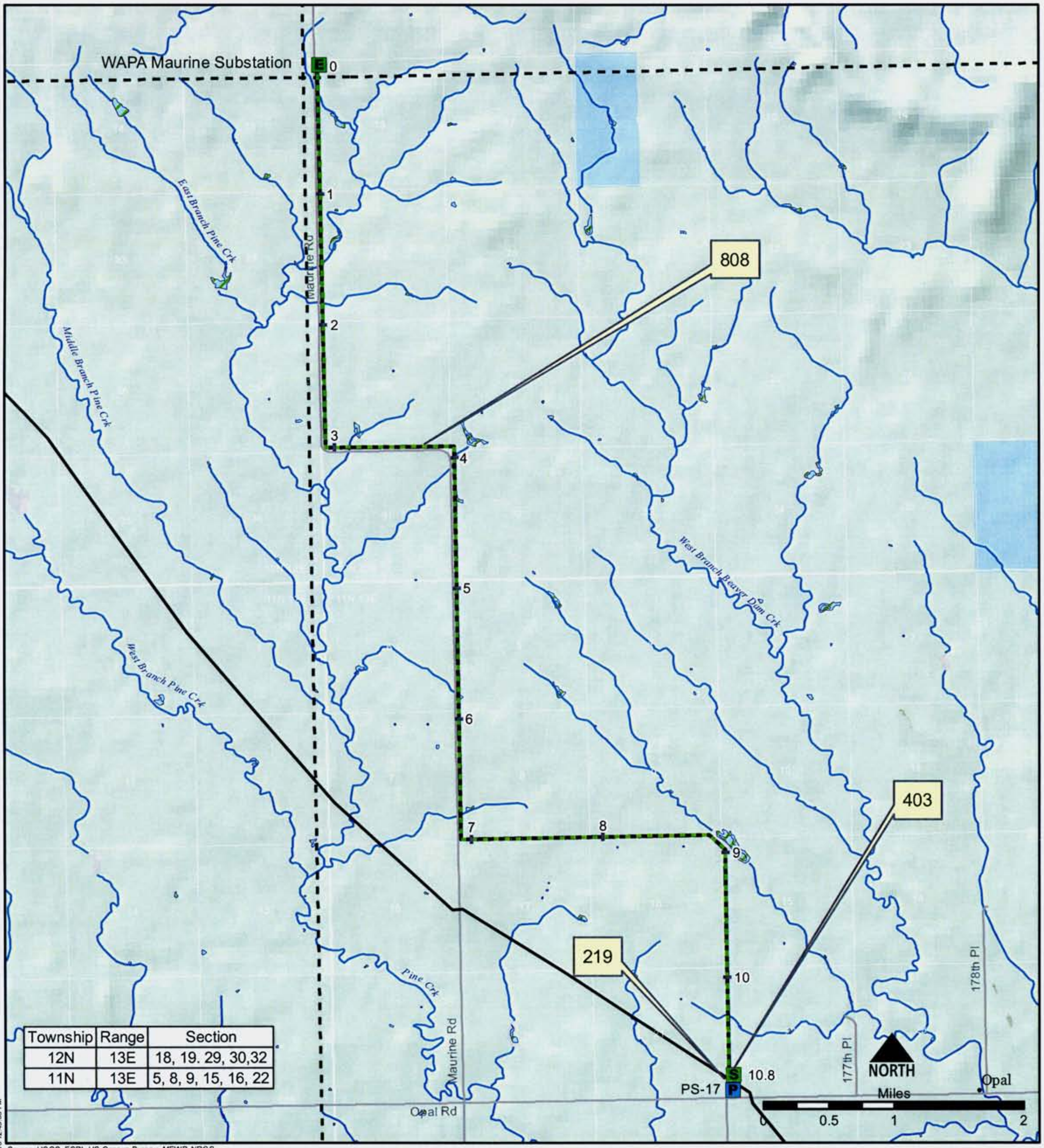
Service Area

Wetlands

Projects 330, 331

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
12N	13E	18, 19. 29, 30,32
11N	13E	5, 8, 9, 15, 16, 22

Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

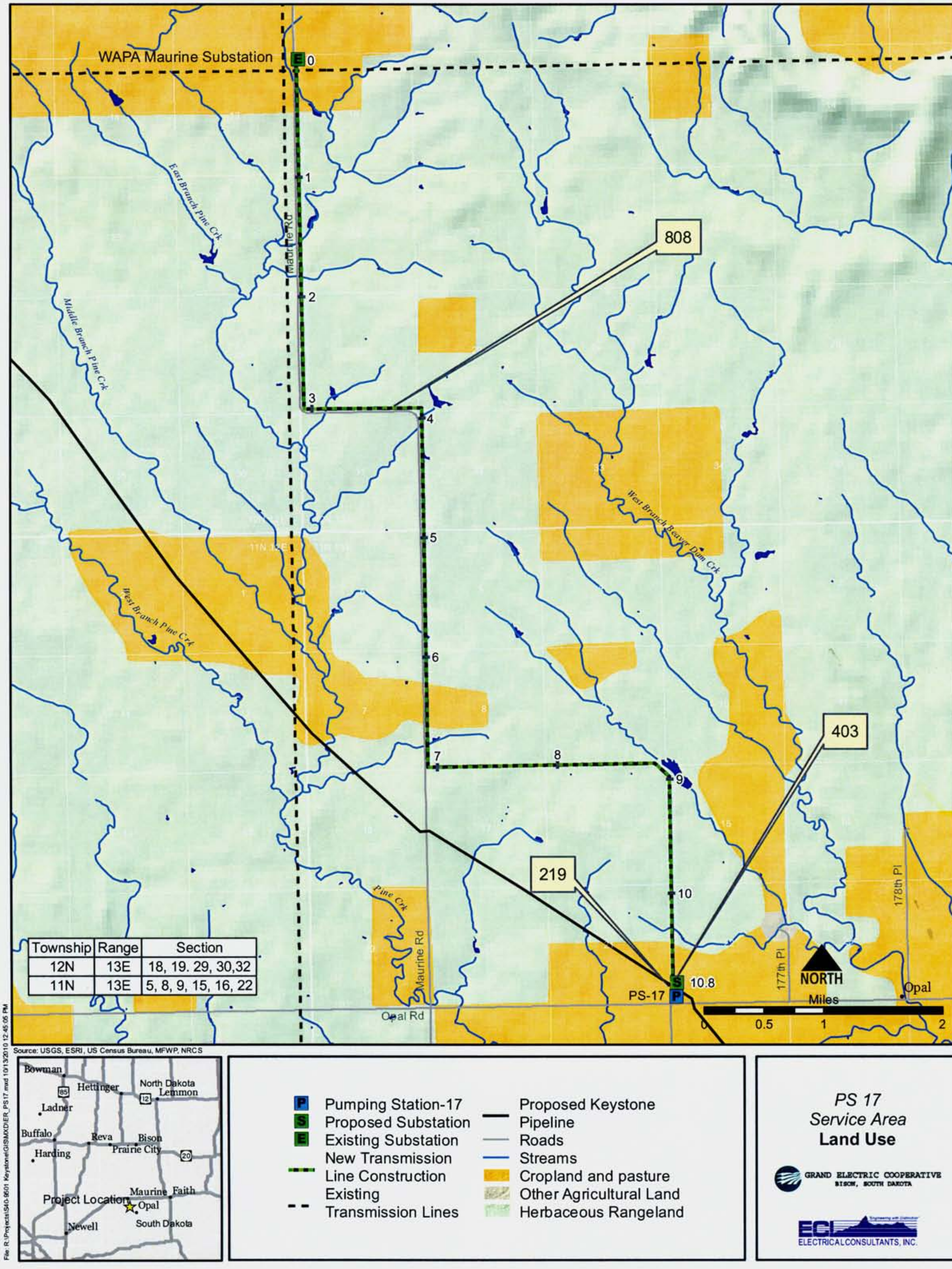
File: R:\Projects\S40-9501 Keystone\GIS\MXD\ER_PS17.mxd 10/13/2010 12:45:05 PM

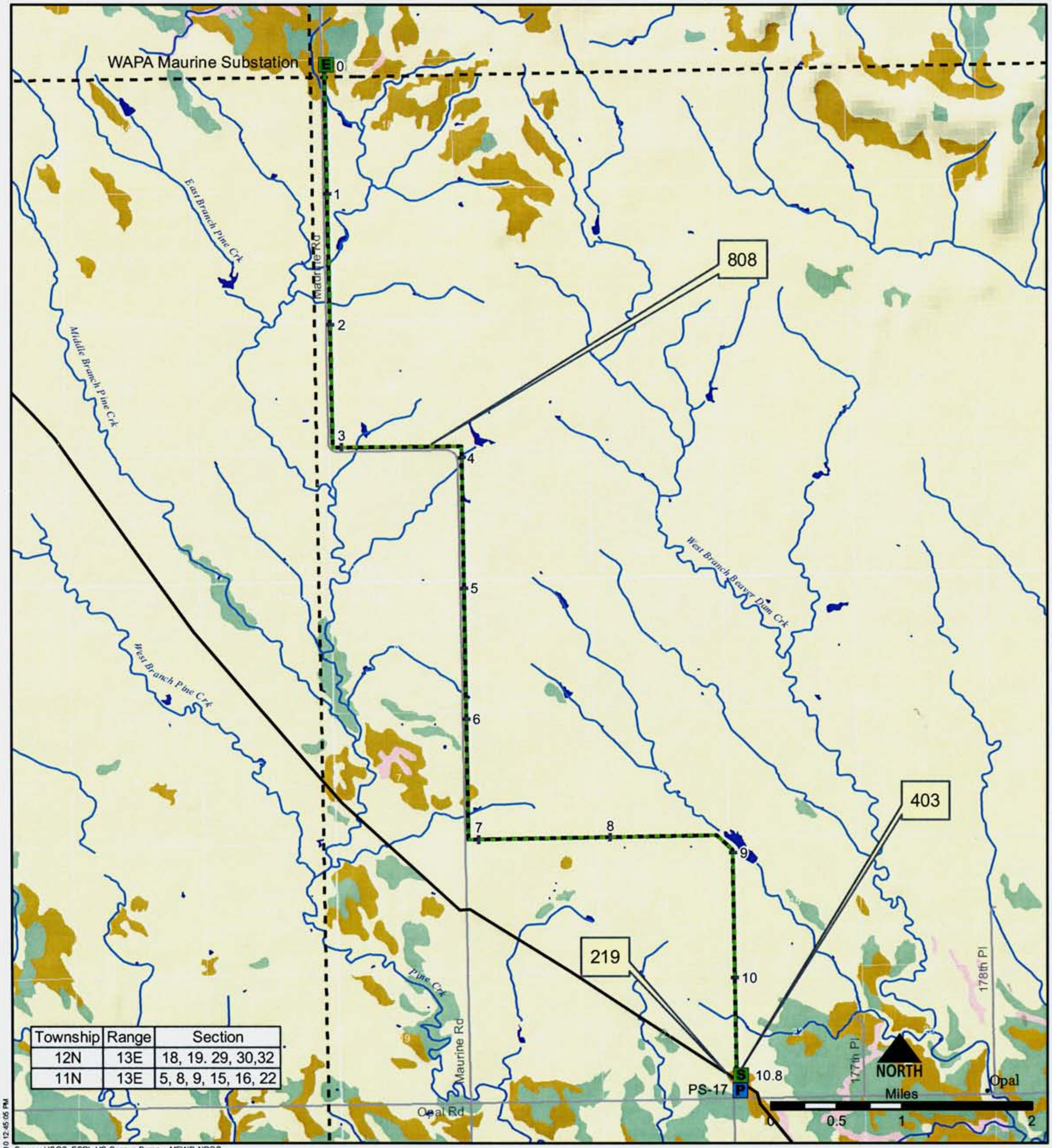
P Pumping Station-17
S Proposed Substation
E Existing Substation
New Transmission Line Construction
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams
State
Private

PS 17
Service Area
Jurisdiction

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI ELECTRICAL CONSULTANTS, INC.


WAPA Maurine Substation
808
403
219
East Branch Pine Crk
Middle Branch Pine Crk
West Branch Pine Crk
West Branch Beaver Dam Crk
Pine Crk
Maurine Rd
Opal Rd
177th Pl
178th Pl
Opal
PS-17
10.8
NORTH
Miles
0 0.5 1 2
Township | Range | Section
12N | 13E | 18, 19. 29, 30,32
11N | 13E | 5, 8, 9, 15, 16, 22
Source: USGS, ESRI, US Census Bureau, MFWP, NRCS
Bowman
Hettinger
North Dakota
Lemmon
Ladner
Buffalo
Reva
Bison
Prairie City
Harding
Project Location
Maurine
Faith
Opal
Newell
South Dakota
Pumping Station-17
Proposed Substation
Existing Substation
New Transmission Line Construction
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams
Cropland and pasture
Other Agricultural Land
Herbaceous Rangeland
PS 17
Service Area
Land Use
GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA
ECI
ELECTRICAL CONSULTANTS, INC.



Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

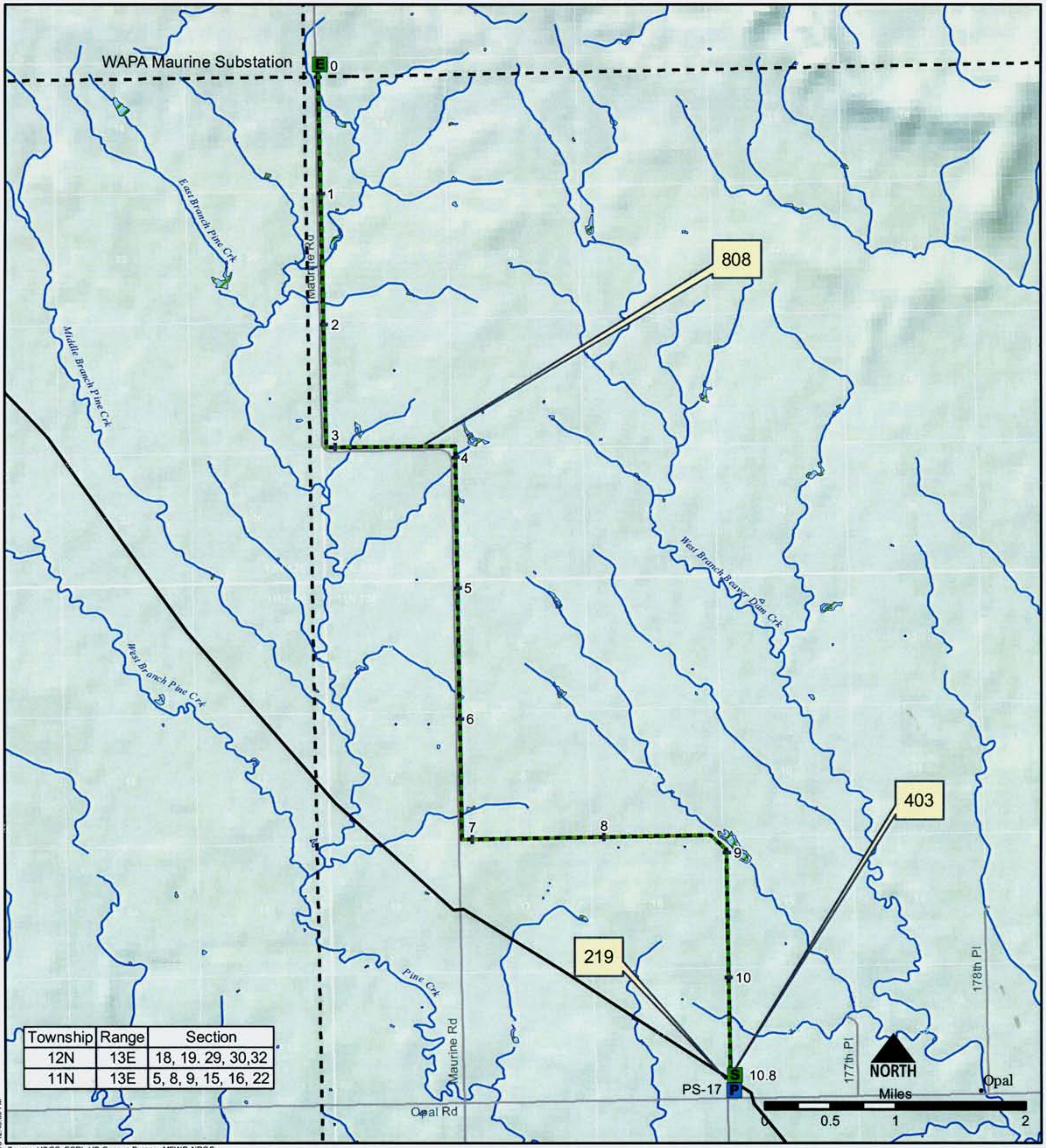
P Pumping Station-17
S Proposed Substation
E Existing Substation
New Transmission Line Construction
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams
All areas are prime farmland
Farmland of statewide importance
Non-Prime farmland
Prime farmland if irrigated

PS 17
Service Area
Prime Farmland

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ELECTRICAL CONSULTANTS, INC.

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS17.mxd 10/13/2010 12:45:05 PM



Township	Range	Section
12N	13E	18, 19. 29, 30,32
11N	13E	5, 8, 9, 15, 16, 22

Source: USGS, ESRI, US Census Bureau, MFWP, NRCS

File: R:\Projects\540-9501 Keystone\GIS\MXD\ER_PS17.mxd 10/13/2010 12:45:05 PM

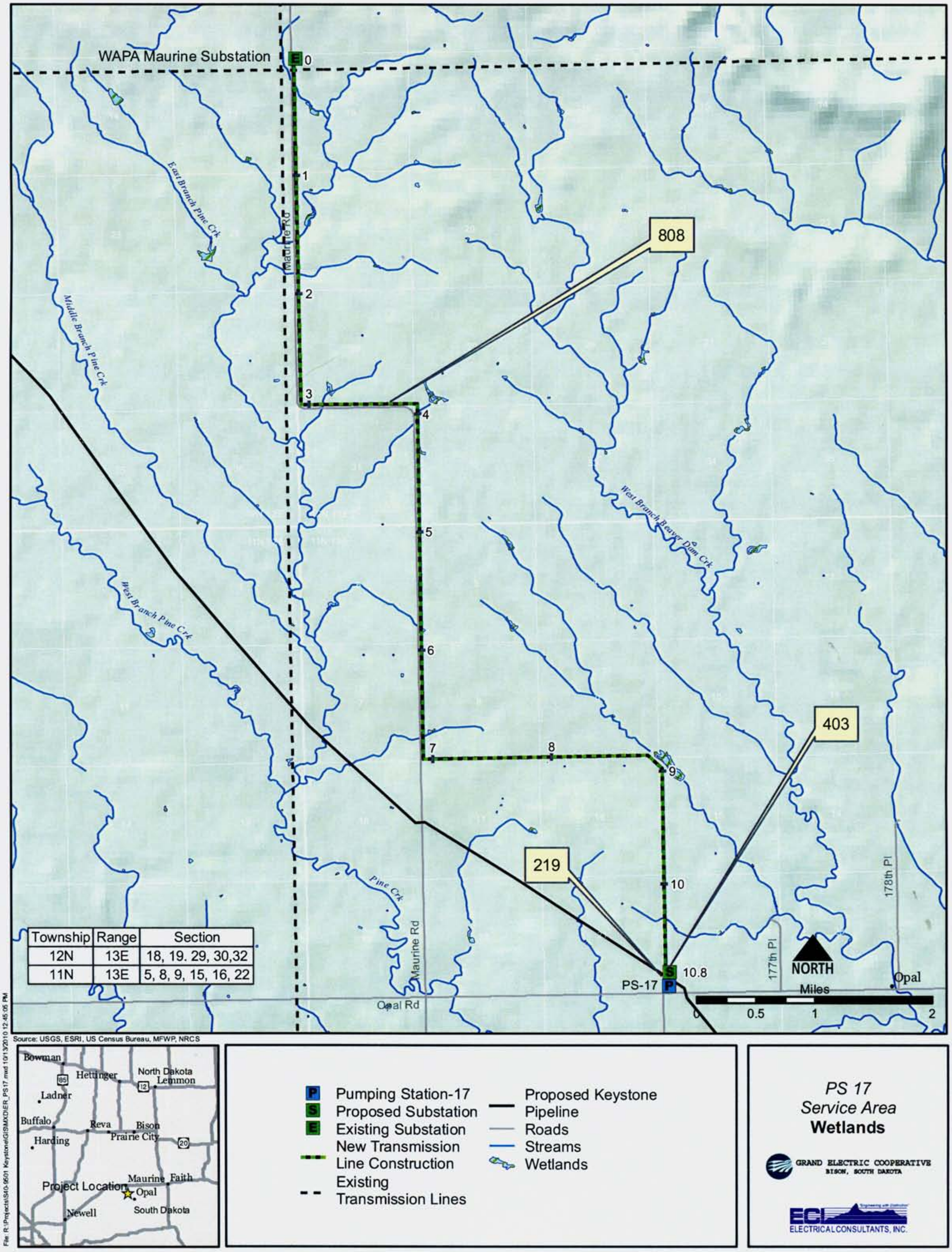
P Pumping Station-17
S Proposed Substation
E Existing Substation
New Transmission Line Construction
Existing Transmission Lines
Proposed Keystone Pipeline
Roads
Streams

No Sage Grouse found in the project area.

PS 17
Service Area
Sage Grouse

GRAND ELECTRIC COOPERATIVE
BISON, SOUTH DAKOTA

ECI
ELECTRICAL CONSULTANTS, INC.



Township	Range	Section
12N	13E	18, 19. 29, 30,32
11N	13E	5, 8, 9, 15, 16, 22

-Page intentionally left blank-

APPENDIX I

Spill Prevention Control and Countermeasure Plan and Emergency Response Plan Sections

-This page intentionally left blank-

Keystone XL Pipeline Project

Spill Prevention, Control and Countermeasure Plan

DRAFT

Subject to Change

Note: This document is a template for the Project's Spill Prevention, Control and Countermeasure Plans and will be finalized by each contractor based on all required site-specific information.

Table of Contents

1 Introduction

The purpose of this Spill Prevention, Control and Countermeasure (SPCC) Plan is to establish procedures to prevent the discharge of hazardous or regulated materials during construction of the Keystone XL Pipeline Project (Project), particularly into or upon Waters of the U.S. The SPCC Plan is designed to reduce the likelihood of a spill, provide for prompt identification and proper removal of contaminated materials if a spill does occur, comply with applicable state and federal laws (e.g., Title 40 Code of Federal Regulations [CFR] Parts 112 and 122) and Project permits, and to protect human health and the environment. The SPCC Plan is designed to complement existing laws, regulations, rules, standards, policies and procedures pertaining to safety standards and pollution rules, in order to minimize the potential for unauthorized releases of hazardous materials, fuels and lubricants.

TransCanada Keystone Pipeline, L.P. (Keystone) anticipates that the Project Pipeline construction contactor (Contractor) will store or handle more than the threshold quantities of oil products and will therefore be subject to federal SPCC preparation requirements. In conformance with federal regulations, a cross-reference table is provided in **Attachment A** that lists the relevant sections in Title 40 CFR 112.7 and the equivalent sections in this SPCC Plan.

Amendments to the SPCC Plan will be made as necessary during construction to account for increases in the volumes of materials stored or other changes associated with the handling or storage of hazardous materials.

1.1 Scope

This SPCC Plan applies to all construction and reclamation activities on the Project, but does not cover pipeline or pump station operations or maintenance. The Keystone XL Project Emergency Response Plan will contain the SPCC requirements for operation and maintenance of the pipeline and pump stations.

This plan outlines the procedures for prevention, containment, and control of potential spills during Project construction and reclamation. The SPCC Plan applies to the use of hazardous materials on the right-of-way and all ancillary facilities. This includes the refueling or servicing of all equipment with diesel fuel, gasoline, lubricating oils, grease, hydraulic and other fluids during normal upland work and for special applications located within 100 feet of streams and wetlands. In addition, site-specific information to be provided by the Contractor is identified and will be attached to the document.

This document is not a complete summary of all requirements. The Contractor is responsible for thoroughly researching, understanding, and complying with all applicable federal, state, and local requirements related to all aspects of work on the Project, including polluting, toxic, and hazardous materials handling, storage, transportation, spill prevention, clean-up and disposal, documentation, notification, hazardous waste, and training.

2 Contractor Supplied Site-Specific Information

This document is a template for the Project's SPCC Plans and will be finalized by each contractor based on all required site-specific information.

The following information must be supplied by the Contractor for review and approval by Keystone at least 30 days prior to construction activities.

- Contractor yard or fueling station facility diagram (**Attachment B**) showing at a minimum the following:
    - storage tanks, including content and capacity;

  - mobile portable containers that store 55 gallons or more (including contents and capacity);
  - oil-filled equipment, electrical transformers, circuit breakers, etc. that store 55 gallons or more;
  - any other oil-filled equipment (including content and capacity);
  - oil/fuel transfer area;
  - secondary containment structures;
  - storm drain inlets and surface waters that could be affected by a discharge;
  - direction of flow in the event of a discharge (topography) and potential receiving waters;
  - legend that indicates scale and identifies symbols used in the diagram;
  - location of response kits and firefighting equipment;
  - location of valves or drainage system control that could be used in the event of a discharge to contain materials on the site; and
  - compass direction.

- A complete inventory of all hazardous materials that will be used or stored on site, including reportable quantities in compliance with state and federal law (**Attachment C**);
- Contractor's training program for fuel truck drivers and mechanics (See **Attachment D** and Section 3,1 Training section below for details);
- Designation of the Contractor's Spill Response Coordinator (to be included in **Attachment E** Emergency Response Contacts);
- Emergency response procedures (**Attachment F**), as described in the Construction Mitigation and Reclamation Plan. In addition, the Contractor will include a prediction of the direction, rate of flow, and total quantity of oil/fuel which has the reasonable potential to be discharged, based on experience. A form has been provided in **Attachment F**;
- Contractor's Commitment to providing the necessary emergency response support for the Project (**Attachment G**);
- Certification by a registered Professional Engineer (**Attachment H**);
- A complete discussion of applicable state-specific requirements regarding oil product and hazardous materials handling that are stricter than the federal requirements (to be included in **Attachment I** State Requirements), if any. If none, then the Contractor will clearly state that in the discussion;
- Material Safety Data Sheets (MSDS) as supplied by the Contractor (**Attachment J**); and
- Any mutual aid agreements between the Contractor and other emergency response personnel.

The Contractor is encouraged to use the Environmental Protection Agency's (EPA) guidance document for preparing facility diagrams provided at the following website: www.**epa.gov**/oilspill/pdfs/guidance/6_FacilityDiagrams.pdf.

Amendments to the Contractor-Supplied SPCC Plan will be made as necessary during construction to account for increases in the volumes of materials stored or other changes associated with the handling or storage of hazardous materials.

3 Prevention

Keystone's goal is to prevent spills or exposure to hazardous or dangerous substances during construction of the Project. The Contractor is required to follow the prevention measures outlined below and implement other measures as necessary and required to promote spill prevention.

3.1 Training

Personnel accountable for carrying out the procedures specified in this plan will be designated before construction and informed of their specific duties and responsibilities with respect to environmental compliance and hazardous materials. The Contractor will be required to provide additional spill prevention, response and hazardous materials handling training to all of their staff who handle hazardous materials, fuels and lubricants on a regular basis. The Contractor will provide the details of this training to Keystone prior to the start of work (**Attachment D**). At a minimum, training will include:

- A review of this SPCC Plan;
- An overview of all regulatory requirements;
- Waste minimization practices;
- Proper storage and handling methods for hazardous materials, fuels, lubricants, gases, etc.;
- Spill prevention, clean-up, and reporting requirements;
- Proper disposal techniques for hazardous materials, fuels, lubricants, etc.;
- Proper procedures for transferring fuels and containing fluids while doing maintenance on vehicles;
- Special requirements for refueling within 100 feet of wetlands and waterbodies;
- The location of the MSDSs and the SPCC Plan;
- The proper use of personal protective equipment;
- Emergency and spill response material locations, proper use, and maintenance;
- Emergency contact information and notification procedures; and
- Procedures for documenting spills and standard spill information to be provided to Keystone for agency notification.

All personnel working on the Project, including all Contractor personnel, are required to attend a Project-sponsored training session prior to starting work. Keystone will conduct training to ensure all responsible Contractor employees know of and comply with all project-specific environmental and TransCanada environmental policy requirements. The environmental training program will address refueling restrictions, hazardous materials handling, spill prevention and cleanup requirements, as well as other Project environmental and safety topics.

3.2 Site Security

The Contractor's site-specific plan and documentation for the construction yard will address site security procedures. Bulk fuel storage areas (including valves and switches), fuel trucks, lubricants and hazardous materials will be secured to minimize tampering and accidental releases by unauthorized personnel. Site security will include the following, in compliance with 40 CFR 112.7(g):

- The oil/fuel storage site will be fully fenced with a locked or guarded entrance gate when facility is unattended;
- Container master flow and drain valves will be secured so that they will remain in the closed position when not in use;
- Fuel pump starter controls will be locked in the "off" position where only authorized personnel can access them when not in use; and
- Facility lighting at night that will assist leak detection and vandalism prevention.

If the above procedures will not be followed, the Contractor will provide a detailed explanation of why the site cannot be secured as described above and the equivalent method the Contractor will use to secure the site.

All storage containers will be closed when not in use and the storage areas will be secured (gated, locked and/or guarded) at night and/or during non-construction periods.

3.3 Equipment Inspection and Maintenance

The Contractor will ensure that all equipment is free of leaks prior to use on the Project, and prior to entering or working in or near waterbodies or wetlands. Throughout construction, the

Contractor will conduct regular maintenance and inspections of the equipment to reduce the potential for spills or leaks.

Contractor mechanics will assess the general condition of equipment valves, lines and hoses and all deteriorated parts will be promptly repaired or replaced. Vehicles and equipment that develop leaks during construction activities will cease work, move to a location at least 100 feet from streams or wetlands, and buckets or absorbent materials will be placed under the equipment until the leak can be repaired. Soils contaminated by the leaking material will be collected and removed from the right-of-way for proper disposal. Equipment that requires extensive repairs will be removed from the right-of-way until the repairs are completed or a protection plan will be developed by the Keystone Environmental Inspector if the equipment can not be moved.

All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. Mechanics will take precautionary measures when performing equipment maintenance or repair activities by placing absorbent pads (or equivalent materials) on the ground beneath the equipment when changing crankcase oil, repairing hydraulic lines, or adding coolant to construction equipment and when appropriate for other repair activities.

All equipment parked overnight shall be at least 100 feet from a watercourse or wetland, if possible. Equipment shall not be washed in streams or wetlands.

3.4 Materials Storage and Handling

The Contractor shall ensure that all oil products, fuels, gases, hazardous and potentially hazardous materials are transported, stored and handled in accordance with all applicable legislation.

Staging areas (including contractor yards and pipe yards) will be set up for each construction spread. Contractors conducting work in each of these areas will establish bulk fuel storage tanks within the staging area, or they will fill their fuel trucks at existing bulk fuel dealerships. In addition, a variety of lubricants and materials will be stockpiled at the staging area for use during construction of the Project. Bulk fuel storage tanks, fuel trucks and stockpiles of lubricants or hazardous materials will be stored only in the designated staging areas and equipment storage yards, and at least 100 feet from all streams and wetlands. No hazardous materials will be stored in areas subject to flooding or inundation.

Spent oils, lubricants, filters, etc. shall be collected and disposed of or recycled at an approved location in accordance with state and federal regulations.

Keystone contractors will not keep on site or operate the following:

- Completely or partially buried storage tanks
- Buried piping
- Internal steam heat coils
- Large, field-erected storage tanks

The following sections detail Project requirements associated with storage of bulk fuels and lubricants, as well as temporary storage of hazardous materials at staging areas.

3.4.1 Tanks

Keystone contractors will maintain commonly used fuels such as gasoline and diesel in bulk storage tanks in the pipeline contractor yards. All storage tanks or trailers, rigid steel piping, valves and fittings and fuel transfer or dispensing pumps will be contained within a secondary containment structure providing 110 percent containment volume of the largest storage tank or trailer within the containment structure. This containment structure will consist of sandbag or earth berms lined with a chemical resistant membrane liner or a concrete structure. The

Contractor will remove any collected precipitation from the containment structure to maintain 110 percent capacity. The Contractor will inspect accumulated precipitation first for evidence of oil or contamination and then collect the material for proper disposal off-site.

The attached drawings are typical layouts for diesel and gasoline fuel transfer stations. Self-supporting tanks will be constructed of carbon steel or other materials compatible with contents of each tank, and all tanks will be elevated above grade and inspected weekly and when the tank is refilled. To prevent overfill, all tanks will have visual level gauges and actual tank levels will be checked against the gauge reading during inspections. Inspection records shall be maintained by the Contractor.

For receiving and offloading fuels from a fuel distributor into the bulk storage tanks, the distributor will connect a petroleum rated hose from the delivery tanker to the fuel transfer stations fill line at the fill truck connection. The fill truck connection and fill line will consist of a cam-loc connection followed by a block valve, rigid steel piping, tank block valve(s) and check valve(s) just upstream of the connection to the tank. Off-loading of fuel is normally accomplished by a transfer pump powered by the delivery vehicle's power take off. Proper grounding of equipment shall be undertaken during fuel transfer operations. Fuel trucks from fuel distributors will be inspected closely prior to leaving the contractor yard to ensure that all valves are tightly closed and no leaks occur during transit.

For transfer of fuels from the bulk storage tanks in the contractor yards to fuel distribution trucks, the truck will connect a petroleum rated hose between the truck's tank and the bulk storage tank's withdrawal connection. The withdrawal truck connection and withdrawal line will consist of rigid steel piping from the tank, through a block valve(s) to an electric explosion-proof fuel transfer pump. Downstream of the fuel transfer pump will be a cam-loc connection. The fuel transfer pump will be equipped with an emergency shut-off at the pump and a secondary emergency shut-off at least 100 feet away. Proper grounding of equipment shall be undertaken during fuel transfer operations. Fuel truck drivers will inspect the truck after each re-filling from the bulk fuel tanks in the contractor yard to ensure that all valves are tightly closed and no leaks occur during transport.

For dispensing gasoline and on-road diesel to equipment or vehicles, the transfer pump will be a dispensing pump with petroleum rated hoses with automatic shut-off nozzles. Refueling operations will be attended closely at all times by personnel familiar with the operation of the refueling equipment. Warning signs requiring drivers to set brakes and chock wheels shall be displayed at all fixed refueling points. Proper grounding of equipment shall be undertaken during fuel transfer operations.

3.4.2 Containers

All containers 55 gallons or greater shall be stored on pallets within a secondary temporary containment structure. Secondary containment structures may consist of temporary earthen berms with a chemical resistant liner or a portable containment system constructed of steel, PVC, or other suitable material. The secondary containment structure will be capable of containing 110 percent of the volume of material stored in these areas. The Contractor will inspect all container storage areas for leaks and deterioration at least weekly, and leaking or deteriorated containers will be replaced as soon as the condition is first detected. In the event of a leak or deterioration of the container or liner, cleanup measures would be implemented to remediate all contamination.

No incompatible materials will be stored in the same containment area and the containers must be suitable and compatible with the wastes or materials in them. If a container leaks or sustains damage, its contents must be transferred to a container in good condition. Waste and hazardous materials will be kept in separate containers for proper disposal.

Containers holding hazardous substances will be closed during transport and storage, except as necessary to add or remove the substance.

3.4.2.1 Container Labeling Requirements

The Contractor will comply with labeling requirements for any on-site containers, including tanks that store fuels, lubricants, accumulated hazardous wastes and other materials. Hazardous waste containers will be labeled, as required in Title 40 CFR Part 262, and will display at least the following:

- Chemical name (e.g., oil, diesel, etc.);
- When the container reaches 55 gallons in volume, the accumulation start date and/or the start date of the 90-day storage period; and
- The words “Hazardous Waste” and warning words specifying the relevant hazards, such as “flammable”, “corrosive”, or “reactive”.

3.4.3 Concrete Coating

Concrete coating and any washout necessary will be conducted at least 100 feet from wetlands or waterbodies boundaries whenever possible. In some circumstances, it may not be possible to maintain this buffer due to topography or the extent of the resource. If it is necessary to apply concrete coating less than 100 feet from a wetland or waterbody boundary, then sufficient containment (such as plastic sheeting and berms, etc.) will be provided by the Contractor to prevent any uncured concrete or concrete washout from reaching the ground. Excess concrete shall not be disposed of in wetlands or waterbodies. Concrete washout shall be contained within the work area and will not be allowed to enter wetlands, waterbodies, or storm drains.

3.4.4 Disposal of Solid and Hazardous Wastes

The Contractor will be responsible for ensuring that the regular collection and disposal of all solid and hazardous wastes generated during its operations is in compliance with all applicable laws. If state laws pertaining to waste disposal are more stringent than federal laws, state laws will take precedence. The Contractor will determine the details on the proper handling and disposal of hazardous waste, and will assign responsibility to specific individuals before construction.

All hazardous wastes being transported off-site shall be manifested. The manifest shall conform to requirements of the appropriate state agency. The transporter shall be licensed and certified to handle hazardous wastes on the public highways. The vehicles as well as the drivers must conform to all applicable vehicle codes for transporting hazardous wastes. The manifest shall conform to regulations of the Department of Transportation Title 49 CFR 172.101, 172.202, and 172.203.

Hazardous wastes will typically include contaminated soils, spent batteries, and other items. The Contractor will make every effort to minimize hazardous waste production during the Project, including, but not limited to:

- Minimizing the amount of hazardous materials needed for the Project;
- Using alternative non-hazardous substances when available; and
- Recycling usable materials, such as batteries, to the extent possible.

3.4.5 Equipment Refueling and Servicing

All equipment refueling will be performed in upland areas at least 100 feet from all wetlands and waterbodies, and at least 150 feet from private and public water wells, respectively. If site-specific constraints require refueling/servicing the equipment closer than 100 feet from the wetland or waterbody, special precautions may be implemented with the Environmental Inspector’s approval – as described below.

At all refueling locations along the right-of-way, the Contractor will ensure that absorbent materials are on hand at all times. Each refueling vehicle shall have a sufficient number of shovels, brooms, 10-mil polyethylene sheeting, and fire protection equipment to contain a moderate spill.

During refueling, the Contractor will take appropriate measures to reduce the risk of a spill, including not overfilling fuel tanks and placing an absorbent pad under the fuel nozzle while fueling equipment. Contractor personnel will observe and control refueling at all times to prevent overfilling. Drivers of tank trucks are responsible for safety and spill prevention. Procedures for loading and unloading tank trucks shall meet the minimum requirements established by the Department of Transportation.

3.4.6 Spill Response Equipment

The Contractor will be required to have emergency response equipment available at all areas where hazardous materials are handled or stored. This equipment shall be readily available to respond to a hazardous material emergency. The Contractor is required to have the appropriate spill response materials on site to address spills of materials stored or handled at the location. Such equipment shall include, but not be limited to, the following:

- First aid kits and supplies, sized to meet the needs of the numbers of personnel anticipated;
- Telephone or communications radio;
- Personal protective equipment (Tyvek® or equivalent suits, gloves, goggles, hard hat, and other personal protective equipment appropriate to the materials to be handled);
- Fire extinguishers;
- Absorbent materials;
- Storage containers;
- Non-sparking bung wrench; and
- Shovels.

Hazardous material emergency containment and clean-up materials and equipment shall be carried in all fuel trucks, mechanic and supervisor (foremen) vehicles. This equipment shall include, at a minimum:

- 2 shovels;
- First aid kit and supplies;
- Telephone or communications radio;
- Phone numbers for emergency contacts;
- 2 sets of protective clothing (Tyvek® or equivalent suit, gloves, goggles, boots);
- 6 heavy duty plastic garbage bags (30 gallon);
- 5 absorbent socks;
- 10 spill pads;
- 20 lb. fire extinguisher;
- Barrier tape;
- 2 orange reflector cones; and
- 200 square feet 10-mil plastic sheeting.

Fuel and service trucks shall also carry a minimum of 20 pounds of suitable commercial sorbent material and a catch-pan for fluids.

Each construction crew, including clean-up crews shall have on hand sufficient tools and materials to stop leaks and supplies of absorbent and barrier materials to allow rapid containment and recovery of spilled materials.

The Contractor shall inspect emergency equipment weekly, and service and maintain equipment regularly, replenishing supplies as necessary. Records shall be kept of all inspections and service.

3.4.7 Activities in Environmentally Sensitive Areas

The Contractor will obtain approval from the Keystone Environmental Inspector prior to refueling or performing equipment repair (involving lubricants, fuels, oil products, or hazardous materials) within 100 feet of a wetland or waterbody boundary. The Contractor shall monitor the refueling and equipment operation at all times. The Contractor will take precautions to prevent spillage by not overfilling fuel tanks, placing an absorbent pad under the fuel nozzle while fueling, and wiping the nozzle when fueling is complete.

Stationary equipment will be placed within a secondary containment if it will be operated or require refueling within 100 feet of a wetland or waterbody boundary.

In order to respond quickly to a potential spill in a major waterbody, the Contractor shall have on hand during all river crossings at least 400 feet of sorbent boom/sock and provide in **Attachment F** a method for deployment and collection.

4 Spill Control and Countermeasures

It is Keystone's goal to promptly stop spills, however the safety and health of Project personnel and the public is the foremost priority. Personnel should only respond to a spill if they have adequate training to do so safely.

All spills and leaks of hazardous materials and petroleum products will be cleaned up. Upon discovery of a spill, the Contractor will immediately:

1. Assess the area for safety: identify the material spilled, the cause, and any potential hazards. If it is an emergency threatening human health, dial 911. If telephone service is not available or 911 does not work in the area, immediately contact the spread office so emergency responders can be notified. Implement appropriate safety procedures, based on the nature of the hazard.
2. Extinguish or remove ignition sources, if the spilled material is flammable.
3. Shut off leaking equipment, if safe to do so.
4. Stop leaks, if possible.
5. Contain the spill using spill response materials and by creating a berm or dike, if necessary. Block culverts, storm sewers, and other points, if necessary to limit spill travel.
6. Notify supervisor of the spill, including material, quantity, time, and location. Supervisors are responsible for notifying Keystone of spills (see section below).

Personnel entry and travel on contaminated soils shall be minimized. The Contractor will commence spill clean-up immediately, if it is safe to do so. The Contractor is responsible for removing and disposing of contaminated material in accordance with applicable federal, state, and local laws. It is anticipated that most spills will be small and easily removed with a shovel, with contaminated soil deposited in plastic bags or similar containers for transport to the Contractor's yard. Larger spills may require the use of equipment or special services.

All efforts will be made to prevent a release to water resources; however, if the spilled material reaches water, sorbent booms, socks, and/or pads will be deployed to contain and remove the spilled material.

5 Documentation and Reporting

The Contractor shall notify Keystone immediately of any spill of a potentially hazardous substance that meets government reporting criteria as well as any existing soil contamination discovered during construction. If pre-existing contamination is suspected, the Contractor shall stop work in the area and not resume work until authorized to do so by Keystone.

In the event of a spill that meets government reporting criteria, the Contractor shall notify the Keystone representative immediately, who, in turn, shall notify the appropriate regulatory agencies. Any material released into water that creates a sheen must be reported immediately to Keystone. The Contractor is required to notify Keystone immediately if there is any spill of oil, oil products, or hazardous materials that reaches a wetland or waterbody. Incidents on public highways shall be reported to Keystone and the appropriate agencies. A sample spill report form is provided in **Attachment L**.

The Contractor is responsible for documenting spills as required by federal, state, and local regulations.

As described on the EPA's website, facilities that spill more than 1,000 gallons of oil into navigable waters or onto adjoining shorelines in a single incident, or have two reportable oil spills of more than 42 gallons within any 12-month period, must submit a report to the appropriate EPA Regional Administrator within 60 days from the time the spill occurs. More details can be found at the EPA website. EPA will review the report and may require the facility owner or operator to amend the SPCC Plan if it does not meet the regulations or if an amendment is necessary to prevent and contain oil spills from the facility.

6 Inspection and Record Keeping

The Contractor will regularly inspect all storage facilities (not less than weekly) and record the condition of the facility in a weekly log. In addition to inspection items discussed in previous sections, inspections will include the outside of all containers for signs of deterioration, discharges, or accumulation of oil inside containment structures or dikes. Inspections will also include all aboveground valves, piping appurtenances and the general condition of items such as flange joints, expansion joints, valve glands and bodies, pipe supports, and metal surfaces.

In addition to the weekly log, the Contractor will maintain records for hazardous materials and hazardous wastes, as required by all applicable federal, state, and local regulations and permit conditions. Record-keeping requirements include, at a minimum:

- Hazardous materials/Waste inspection log,
- Transportation documents,
- Bills of lading,
- Manifests,
- Shipping papers,
- Training records,
- Release report forms, and
- Spill history and documentation of clean-up/handling.

The Environmental Inspector will monitor, inspect, document and report on the Contractor's compliance with hazardous materials and hazardous waste management practices. Inspection records will be kept with the SPCC Plan for at least three years.

7 Applicable State Requirements

The Contractor is required to include in submittals to Keystone a complete discussion of applicable state-specific requirements regarding oil product and hazardous materials handling that are stricter than the federal requirements, if any, to be included in **Attachment I**. If none, then the Contractor will clearly state that in the discussion.

8 Certification of Non-Substantial Harm

Keystone does not anticipate that this Project will satisfy the “substantial harm” criteria set forth in 40 CFR 112.20(e). The EPA requires that facilities that do not meet the criteria maintain a certification form to that affect with the SPCC Plan. This certification form is included in **Attachment M**.

Attachment A

SPCC Cross Reference Table

SPCC Rule	Description of Section	Page/Section
§ 112.7	General requirements for SPCC Plans for all facilities and all oil types.	1/1
§ 112.7(a)(1)	General requirements; discussion of facility's conformance with rule requirements.	1/1; throughout SPCC Plan
§ 112.7(a)(2)	Deviations from Plan requirements.	3/3.2; 4 & 5/ 3.4.1
§ 112.7(a)(3)	Facility characteristics that must be described in the Plan and the Facility Diagram.	1 & 2/2
§ 112.7(a)(3)(i)	Types of oil and container storage capacity.	Attachment C
§ 112.7(a)(3)(ii)	Discharge prevention measures.	2 through 8/3
§ 112.7(a)(3)(iii)	Discharge or drainage controls.	3 through 7/3.2; 3.3; 3.4
§ 112.7(a)(3)(iv)	Countermeasures for discharge, discovery, response, and cleanup	8/4
§ 112.7(a)(3)(v)	Methods of disposal of recovered or waste materials	4 through 6/3.3; 3.4; 3.4.3; 3.4.4
§ 112.7(a)(3)(vi)	Contact list and phone numbers.	Attachment E
§ 112.7(a)(4)	Spill reporting information in the Plan.	8/5; Attachment I
§ 112.7(a)(5)	Emergency procedures.	2/2; 9/4; Attachment F
§ 112.7(b)	Fault analysis. Equipment failure information.	2/2; Attachment F
§ 112.7(c)	Secondary containment.	4/3.4.1; 5/3.4.2; 7/3.4.7
§ 112.7(d)	Contingency planning, alternative means, integrity testing.	4/3.4.1; 5/3.4.2; 8/4; Attachment F
§ 112.7(e)	Inspections, tests, and records.	4/3.4.1; 5/3.4.2; 9/6
§ 112.7(f)	Employee training and discharge prevention procedures.	2 & 3/3.1
§ 112.7(g)(1)	Security (excluding oil production facilities).	3/3.2
§ 112.7(g)(2)	Flow valves secured.	3/3.2
§ 112.7(g)(3)	Oil pumps controls locked.	3/3.2
§ 112.7(g)(4)	Secure loading/unloading connections on oil piping.	Not Applicable
§ 112.7(g)(5)	Provide facility lighting.	3/3.2
§ 112.7(h)(1)	Loading/unloading (excluding offshore facilities): provide containment system for loading and unloading area.	Not Applicable
§ 112.7(h)(2)	Loading/unloading: systems to prevent vehicles from departing before complete disconnection.	5/3.4.1
§ 112.7(h)(3)	Loading/unloading: inspect vehicle to prevent liquid discharge while in transit.	4/3.4.1
§ 112.7(i)	Brittle fracture evaluation requirements.	Not applicable
§ 112.7(j)	Discuss conformance with more stringent State rule, regulations, and guidelines.	7/9
§ 112.8 / § 112.12	Requirements for onshore facilities (excluding production facilities).	-
§ 112.8(a) / § 112.12(a)	General and specific requirements	See above and below
§ 112.8(b) / § 112.12(b)	Facility drainage.	4/3.4.1
§ 112.8(c) / § 112.12(c)	Bulk storage containers.	4/3.4.1; 5/3.4.2
§ 112.8(d) / § 112.12(d)	Facility transfer operations, pumping, and facility process.	4/3.4.1; 5/3.4.2
§ 112.9 / § 112.13	Requirements for onshore production facilities	Not applicable

SPCC Rule	Description of Section	Page/Section
§ 112.9(a) / § 112.13(a)	General and specific requirements	Not applicable
§ 112.9(c) / § 112.13(c)	Oil production facility bulk storage containers.	Not applicable
§ 112.9(d) / § 112.13(d)	Facility transfer operations, oil production facility.	Not applicable
§ 112.10 / § 112.14	Requirements for onshore oil drilling and workover facilities.	Not applicable
§ 112.10(a) / § 112.14(a)	General and specific requirements.	Not applicable
§ 112.10(b) / § 112.14(b)	Mobile facilities.	Not applicable
§ 112.10(c) / § 112.14(c)	Secondary containment - catchment basins or diversion structures.	Not applicable
§ 112.10(d) / § 112.14(d)	Blowout prevention.	Not applicable
§ 112.11 / § 112.15	Requirements for offshore oil drilling, production, or workover facilities.	Not applicable
§ 112.11(a) / § 112.15(a)	General and specific requirements.	Not applicable
§ 112.11(b) / § 112.15(b)	Facility drainage.	Not applicable
§ 112.11(c) / § 112.15(c)	Sump systems.	Not applicable
§ 112.11(d) / § 112.15(d)	Discharge prevention systems for separators and treaters.	Not applicable
§ 112.11(e) / § 112.15(e)	Atmospheric storage or surge containers; alarms.	Not applicable
§ 112.11(f) / § 112.15(f)	Pressure containers; alarm systems.	Not applicable
§ 112.11(g) / § 112.15(g)	Corrosion protection.	Not applicable
§ 112.11(h) / § 112.15(h)	Pollution prevention system procedures.	Not applicable
§ 112.11(i) / § 112.15(i)	Pollution prevention systems; testing and inspection.	Not applicable
§ 112.11(j) / § 112.15(j)	Surface and subsurface well shut-in valves and devices.	Not applicable

Attachment B

Contractor Yard or Fueling Station Facility Diagram

Attachment C

Hazardous Materials Inventory and Reportable Quantities

Attachment D

Contractor’s Training Program

Attachment E

Emergency Response Contacts

Emergency Response Contacts

DIAL 911 IN CASE OF EMERGENCY

The Contractor is to fill out the applicable information required below. Contractor will attach additional sheets as necessary.

Contractor: ______________________ Spread/Station: ________________________

Contractor Spill Response Coordinator: ____
NAME TELEPHONE NUMBER

Keystone Representative: ____
NAME TELEPHONE NUMBER

Sheriffs' Telephone Numbers, by County

County	Telephone Number	County	Telephone Number

Highway Patrol: _________________________ _________________________

U.S. Poison Control Center: 800-222-1222

Hospitals Near Work Areas

Name	Address	Telephone Number	County

Spill Response and Cleanup Contractor: ____
NAME TELEPHONE NUMBER

Spill Response and Cleanup Contractor: ____
NAME TELEPHONE NUMBER

Spill Response and Cleanup Contractor: ____
NAME TELEPHONE NUMBER

Keystone is the designated contact for all agency notifications.

Agency	Telephone Number	Home Page Website	Online Spill Report Form Webpage
Federal			
National Response Center	800-424-8802	http://www.nrc.uscg.mil/nrchp.html	http://www.nrc.uscg.mil/report.html
Montana			
Montana Department of Environmental Quality	800-424-8802	http://www.deq.mt.gov/enf/spillpol.asp	http://www.deq.mt.gov/enf/spill.asp
South Dakota			
South Dakota Department of Environment & Natural Resources	605-773-3296 and 605-773-3231 after hours	http://www.state.sd.us/denr/DES/ground/Spills/SpillReporting.htm	http://www.state.sd.us/denr/DES/ground/Spills/SpillsFollowUp.asp
Nebraska			
Department of Environmental Quality	402-471-2186 or 877-253-2603 and Nebraska State Patrol at 402-471-4545 after hours	http://www.deq.state.ne.us/	Not applicable
Kansas			
Kansas Emergency Management	800-275-0297 or 785-296-8013	http://www.kansas.gov/kdem/hazards/hmenrg.shtml	http://www.kansas.gov/kdem/pdf/hazards/082102_formA.pdf
Oklahoma			
Oklahoma Corporation Commission	918-367-3396 and 405-521-2240 after hours	http://www.occ.state.ok.us/Divisions/OG/spill(c).htm	Not applicable
Texas			
Texas Commission on Environmental Quality (TCEQ)	800-832-8224	http://www.tceq.state.tx.us/response/spills.html	Not applicable

Attachment F

Contractor's Emergency Response Procedures

Equipment Failure and Potential Spill Source Prediction[1]

Source	Type of Failure	Total Quantity (gallons)	Rate of Flow (gpm)[2]	Direction of Flow	Containment

[1] Title 40 CFR 112 states: “where experience indicates a reasonable potential for equipment failure (such as loading or unloading equipment, tank overflow, rupture, or leakage, or any other equipment known to be a source of a discharge), include in your Plan a prediction of the direction, rate of flow, and total quantity of oil which could be discharged from the facility as a result of each type of major equipment failure.”

[2] GPM = gallons per minute

Attachment G

Contractor's Commitments

Contractor's Commitments

I hereby certify that I am at a level of management within ______________________________, with the authority to, and do hereby commit the necessary manpower, equipment, and materials to implement this SPCC Plan (40 CFR Part 112) in accordance with the provisions set forth therein.

Name: ____________________________

Name: ____________________________ (Signature)

Title/Company: ____________________________________

Date: _____________________________

Attachment H

Professional Engineer's Certification

Registered Professional Engineer Certification

By means of this certification, I attest that:

- **I have reviewed this Spill Prevention, Control and Countermeasure Plan (SPCC);**
- **I am familiar with the requirements of Title 40 Code of Federal Regulations (CFR) Part 112;**
- **I or my agent has visited and examined the facility;**
- **This SPCC Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of Title 40 CFR Part 112;**
- **Procedures for required inspections and testing have been established; and**
- **This SPCC Plan is adequate for the facility.**

____
Signature of Registered Professional Engineer

______________________________________ ________________________________
Name (Printed) **Date**

Attachment I

State Requirements

Attachment J

Contractor's Material Safety Data Sheets (MSDS)

Attachment K

Typical Layouts; Fuel Transfer Stations

Attachment L

Spill Report Form

SPILL REPORT FORM

LOCATION AND DATE DETAILS **Facilit y Telephone Number:**

Form Completed by: ____________________ Date: ____________

Date of spill: ____________________ Time of spill: ____________

Date of spill discovery: ____________________ Time of spill recovery: ____________

Location: ____________________ County: ____________

Short legal description: T_______R________S_________ Weather Conditions: _________

Directions from nearest community: ____________________

____

Name and Title of Discoverer: ____________________
NAME TITLE

SPILL AND MATERIAL DETAILS

Type of material spilled and product name: ____________________

Manufacturer's name: ____________________

Estimated volume spilled: ____________ Estimated volume recovered: _________

Topography and surface condition of spill site: ____________________

Spill medium: ❑ Pavement ❑ Soil ❑ Water ❑ Other: ____________ (Check all that apply)

Responsible party (Name, Phone Number): ____________________
NAME TELEPHONE NUMBER

Describe the causes and circumstances resulting in the spill: ____________________

____

____

____

WATER RESOURCES AFFECTED

Did the spill reach a waterbody? ❑ Yes ❑ No If "Yes", was a sheen present? ❑ Yes ❑ No

Proximity of spill to surface waters or wetlands: ____________Feet

Estimated quantity of material that entered surface waters or wetland: ____________

Direction and time of travel (if in stream): ____________________

____

SPILL REPORT FORM CONTINUED

DESCRIPTION OF SPILL/ HARMFUL EFFECTS

Describe extent of observed contamination, both horizontal and vertical: ____________________
____
____

Resources and installations that may be affected: ____________________________________
____

Describe any injuries or potential impact on human health caused by the spill: _______________
____
____

COURSE OF ACTION

Describe immediate spill control and/or cleanup methods used and implementation schedule: ___
____
____

Evacuation necessary? ❑ Yes ❑ No Describe: ____________________________________
____

Current status of cleanup actions: ____
____

Future follow-up required, if any: ____
____

NAME/COMPANY/TELEPHONE NUMBER FOR THE FOLLOWING

Contractor Superintendent: ____
NAME COMPANY TELEPHONE NUMBER

Contractor's Environmental Coordinator: ________________________________
NAME COMPANY TELEPHONE NUMBER

Lead Environmental Inspector: ____
NAME COMPANY TELEPHONE NUMBER

Other: ____
NAME COMPANY TELEPHONE NUMBER

Contractor must complete this form for any spill that meets state or federal reportable quantities, and for petroleum spills that enter waterbodies or wetlands, affect human health, or exceed 42 gallons, and submit the form to the Lead Environmental Inspector immediately.

Attachment M

Certification of the Applicability of the Substantial Harm Criteria

Certification of the Applicability of the Substantial Harm Criteria

Facility Name: ***Keystone Pipeline Project***
Facility Address: ***Various locations along the pipeline route in Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Mailing address:***

Keystone XL Pipeline Project
7509 Tiffany Springs Parkway
Northpointe Circle II, Suite 200
Kansas City, Missouri 64153

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

Yes _____ No **X**

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?

Yes _____ No **X**

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C–III to this appendix or a comparable formula[3]) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (see Appendix E to this part, section 13, for availability) and the applicable Area Contingency Plan.

Yes _____ No **X**

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1]) such that a discharge from the facility would shut down a public drinking water intake[4] ?

Yes _____ No **X**

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil discharge in an amount greater than or equal to 10,000 gallons within the last 5 years?

Yes _____ No **X**

Certification
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

____
Signature

____
Name (please type or print)

______________________________ ______________________________
Title

[3] If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

[4] For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

United States Department of State 5.6.5

Reference: Keystone XL Project Environmental Report
Oil Risk Assessment and Environmental Consequences Analysis

Request:

We understand that under current regulations, Keystone will not be required to submit an Emergency Response Plan (ERP) until 6 months prior to Project operation. However, DOS has determined that it is appropriate to include a draft ERP in the EIS to provide the public with basic information on the likely procedures that would be followed in the event of an accidental release from Project facilities. As a result, Keystone should provide a draft ERP that reasonably describes the key procedures, coordination activities, anticipated contacts, equipment to be used, possible cleanup activities, and other information needed to understand how Keystone would respond to an accidental release of crude oil during operation of the Project. This draft could be developed using previously approved EPR's, such as the ERP for the Keystone Pipeline Project.

Response:

Attached are responsive portions of the Keystone Pipeline Emergency Response Plan. This plan will be updated to include Keystone XL-specific emergency preparedness and emergency response information prior to Keystone XL project commencing operations.

Prepared By: Niki Affleck, TransCanada

SECTION 1

NOTIFICATION PROCEDURES

This Section is a guide for notification procedures that should be implemented immediately after discovering a discharge incident and, if possible, securing the source. Internal and external notifications are described separately for clarification purposes only. All notifications are of extreme importance and must be completed in a timely manner.

1.1 INTERNAL NOTIFICATION

The following internal notifications will be made for each emergency event (reference is provided in Figure 1.2). Internal notification protocols are developed and implemented to ensure effective communications between all internal parties and support provided by pre-determined on call corporate and business units. The notification protocol includes those responding to an emergency as well as notification to all senior management up to the Chief Executive Officer of the company.

Employee Discovering Discharge

- Immediately notify the Oil Control Center (contact information is listed in Figure 1.2).
- Notify the local fire department, police department, and rescue, as needed.

Oil Control Center

- Verify emergency.
- Immediately notify the Oil Control Center Manager.
- Notify Regional On-Call Manager.
- Notify Corporate Emergency Operations Manager.

Regional Manager On-Call

- Initiates the field response
  - Contacts employees to staff the Incident Command Post
  - Contacts employees to staff the Regional EOC

Regional EOC

- Completes local notifications
- Establishes an emergency communication line (conference line) for use between the Corporate and Regional EOC and the Incident Commander Post for information sharing and support

Corporate Emergency Operations Center Manager

- Contact Oil control Center and review emergency particulars
- Activate Corporate / Business support departments
  - Thirteen pre-determined departments on call 24/7 to provide tactical and strategic support
  - Departments implement their notification protocols advising their line management of the event
- Corporate Security is a Support Department

Corporate Security

- Determine if incident meets the criteria of a crisis
- If criteria met – Notify the Chairman of the Crisis Management Team

Chairman of Crisis Management Team

- Notify members of the Crisis Management Team

FIGURE 1.1
INTERNAL NOTIFICATION SEQUENCE

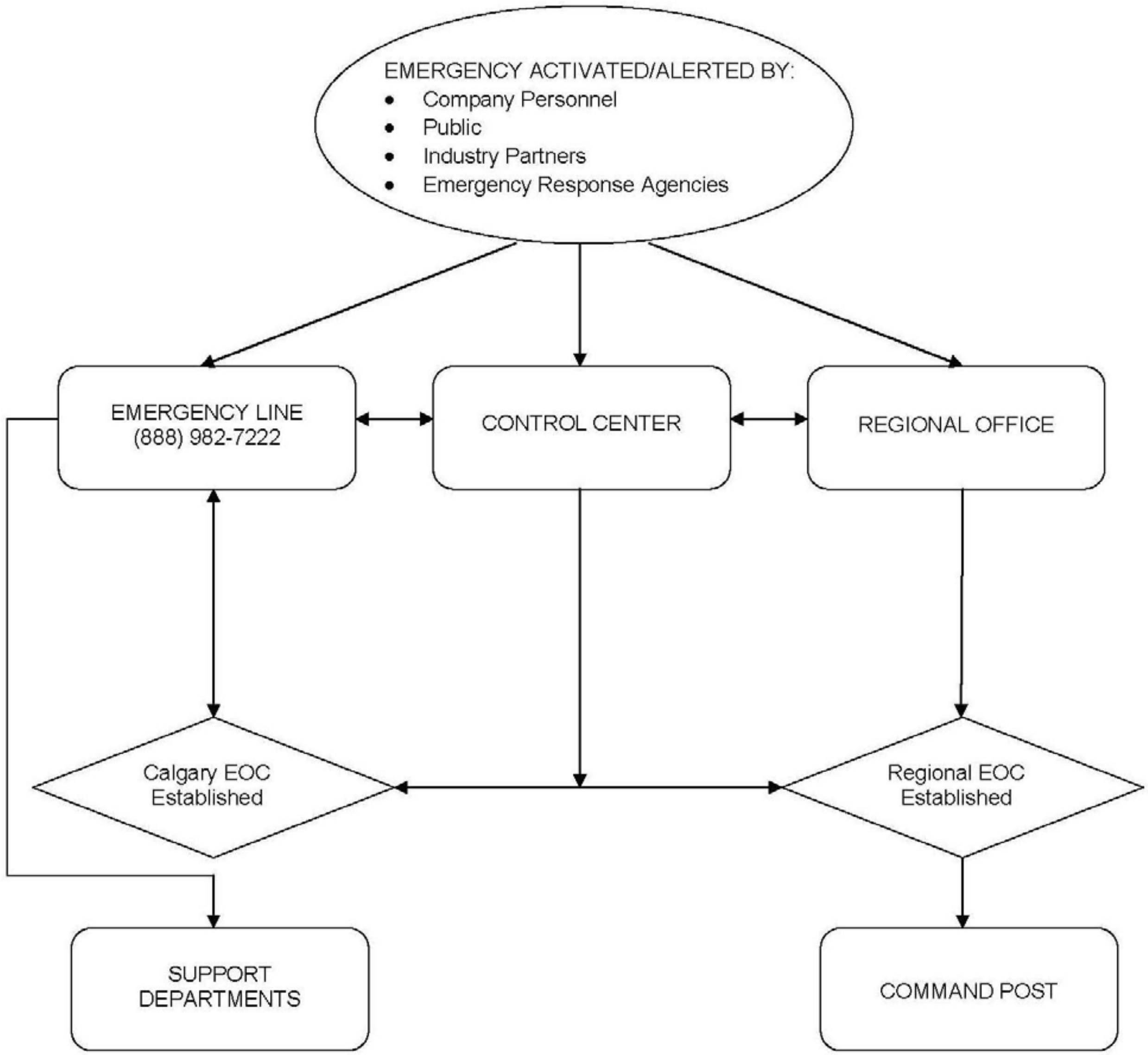


FIGURE 1.2
INTERNAL NOTIFICATION REFERENCES

CORPORATE RESPONSE PERSONNEL / OTHER COMPANY CONTACTS INTERNAL NOTIFICATIONS					
POSITION/TITLE	**NAME**	**OFFICE**	**HOME**	**CELL**	**PAGER**
	Keystone Oil Control Center	(403) 920-8080			

There are no Field Personnel currently working on this proposed Pipeline.

1.2 EXTERNAL NOTIFICATIONS

External notifications are those made to entities outside of the Company including Federal, Province/State and local regulatory agencies, railroad and utility companies and contractors. These notifications include both verbal and written requirements.

Employee Discovering the Discharge

- Notify local emergency services immediately.

Oil Control Center

- Notify the emergency response contractor if this has not been completed by the Regional Manager On-Call.

Regional Manager On-Call

- Notify the contracted Spill Management Team, the O'Brien's Group, and the Spill Response Contractor, National Response Corporation.

TransCanada Personnel

- Notify the U.S. National Response Center, the Cdn Transportation Safety Board, the National Response Corporation, Cdn National Energy Board, appropriate Federal agencies, County Emergency management, Province/State Environmental Agencies, and the Utilities One Call, as needed (notification requirements and contact information are listed in Figure 1.5).

Verbal Notification Requirements

Immediate internal notification is to be made in accordance with the Internal Notification Procedures found in Section 1.1 when a system operational failure or other type of incident occurs. This will allow immediate evaluation and classification of incidents and prompt immediate telephonic notification as detailed in Figure 1.4 and 1.5 to the Transportation Safety Board, National Response Center (NRC), Province/State agencies, local agencies, and other Federal agencies as required. The information found on the Notification Data Sheet, Figure 1.3, should be used to disseminate incident information to the appropriate agencies.

For the purpose of this procedure, immediate reporting means reporting the instant a person has knowledge of an actual or suspected leak, uncontrolled release of product, any unplanned spill or other pipeline system failure. Information that causes any employee to reasonably suspect a leak or uncontrolled release of product must be immediately reported, even when the actual existence or location of a leak or release cannot yet be confirmed.

Written Notification Requirements

In addition to the verbal notification requirements, written notifications are required in both Canada and the United States. In the United States, a written report is to be filed as soon as practical, but not later than 30 days after discovery of the incident to the Information Resources Manager, Office of Pipeline Safety, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation. Information concerning the event shall be reported on Pipeline and Hazardous Materials Safety Administration Form 7000-1 on-line on the Pipeline and Hazardous Materials Safety Administration website via log-in. Paper reports are not required. This report is to be filed for all incidents reported telephonically and other incidents required to be reported in accordance with the criteria listed below.

The information required for completing the 30-day written report will be furnished by the Area Offices to the Department of Transportation Regulatory Compliance Department for submission to the Department of Transportation. Any subsequent or additional information that was not reported on the initial written report must be reported to the Department of Transportation Regulatory Compliance Department by the Area Office. This information will be utilized in filing a supplemental written report to the Department of Transportation as soon as possible, but no later than 30 days after its discovery.

In Canada, a detailed written incident report is required as soon as practicable to the Transportation Safety Board (TSB) and National Energy Board (NEB).

Transportation Safety Board of Canada Pipeline Occurrence Reporting	
Citation	**Description**
Extracts from Transportation Safety Board Regulations Sections 5(1) and 5 (5)	When a reportable pipeline accident or incident takes place, the operator and any employee of the operator having direct knowledge of the accident or incident shall report to the Board as soon as possible and by the quickest means available. Where any person mentioned above makes a report, no other person referred to is required to make such a report.
Transportation Safety Board Regulations Section 2(1)	A "reportable pipeline accident" is an accident resulting directly from the operation of a pipeline, where (a) a person sustains a serious injury or is killed as a result of being exposed to i. a fire, ignition or explosion, or ii. a commodity released from the pipeline, or (b) the pipeline i. sustains damage affecting the safe operation of the pipeline as a result of being contacted by another object or as a result of a disturbance of its supporting environment, ii. causes or sustains an explosion, or a fire or ignition that is not associated with normal operating circumstances, or iii. sustains damage resulting in the release of any commodity.
Transportation Safety Board Regulations Section 2(1)	A "reportable pipeline incident" means an incident resulting directly from the operation of a pipeline where (a) an uncontained and uncontrolled release of a commodity occurs, (b) the pipeline is operated beyond design limits, (c) the pipeline causes an obstruction to a ship or to a surface vehicle owing to a disturbance of its supporting environment, (d) any abnormality reduces the structural integrity of the pipeline below design limits, (e) any activity in the immediate vicinity of the pipeline poses a threat to the structural integrity of the pipeline, or (f) the pipeline, or a portion thereof, sustains a precautionary or emergency shut-down for reasons that relate to or create a hazard to the safe transportation of a commodity.

NOTE: Refer to Figure 1.5 for any additional Province/State written reporting requirements.

FIGURE 1.3

NOTIFICATION DATA SHEET

Date: ____________ *Time:* ____________

INCIDENT DESCRIPTION

Reporter's Full Name: ____________ *Position:* ____________
Day Phone Number: ____________ *Evening Phone Number:* ____________
Company: ____________ *Organization Type:* ____________
Facility Address: ____________ *Owner's Address:* ____________
Facility Latitude: ____________ *Facility Longitude:* ____________
Spill Location:
(if not at Facility) ____________
Responsible Party's Name: ____________ *Phone Number:* ____________
Responsible Party's Address: ____________
Source and/or cause of discharge: ____________
Nearest City: ____________
County: ____________ *State:* ____________ *Zip Code:* ____________
Section: ____________ *Township:* ____________ *Range:* ____________
Distance from City: ____________ *Direction from City:* ____________
Container Type: ____________ *Container Storage Capacity:* ____________
Facility Oil Storage Capacity: ____________
Material: ____________

Total Quantity Released	Water Impact (*YES or NO*)	Quantity into Water

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Incident: ____________
Number of Injuries: ____________ *Number of Deaths:* ____________
Evacuation(s): ____________ *Number Evacuated:* ____________
Damage Estimate: ____________
More information about impacted medium: ____________
Possible hazards to human health or the environment outside of the Facility: ____________

CALLER NOTIFICATIONS

National Response Center (NRC): 1-800-424-8802 *Transportation Safety Board:* 819-997-7887
Additional Notifications (Circle all applicable): *USCG* *NEP* *EPA* *Province* *State* *Other*
National Response Center Incident Assigned No. ____________

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in this report including estimated quantity and disposition of recovered material: ____________

NOTE: DO NOT DELAY NOTIFICATION PENDING COLLECTION OF ALL INFORMATION.

FIGURE 1.4
EXTERNAL NOTIFICATION FLOWCHART

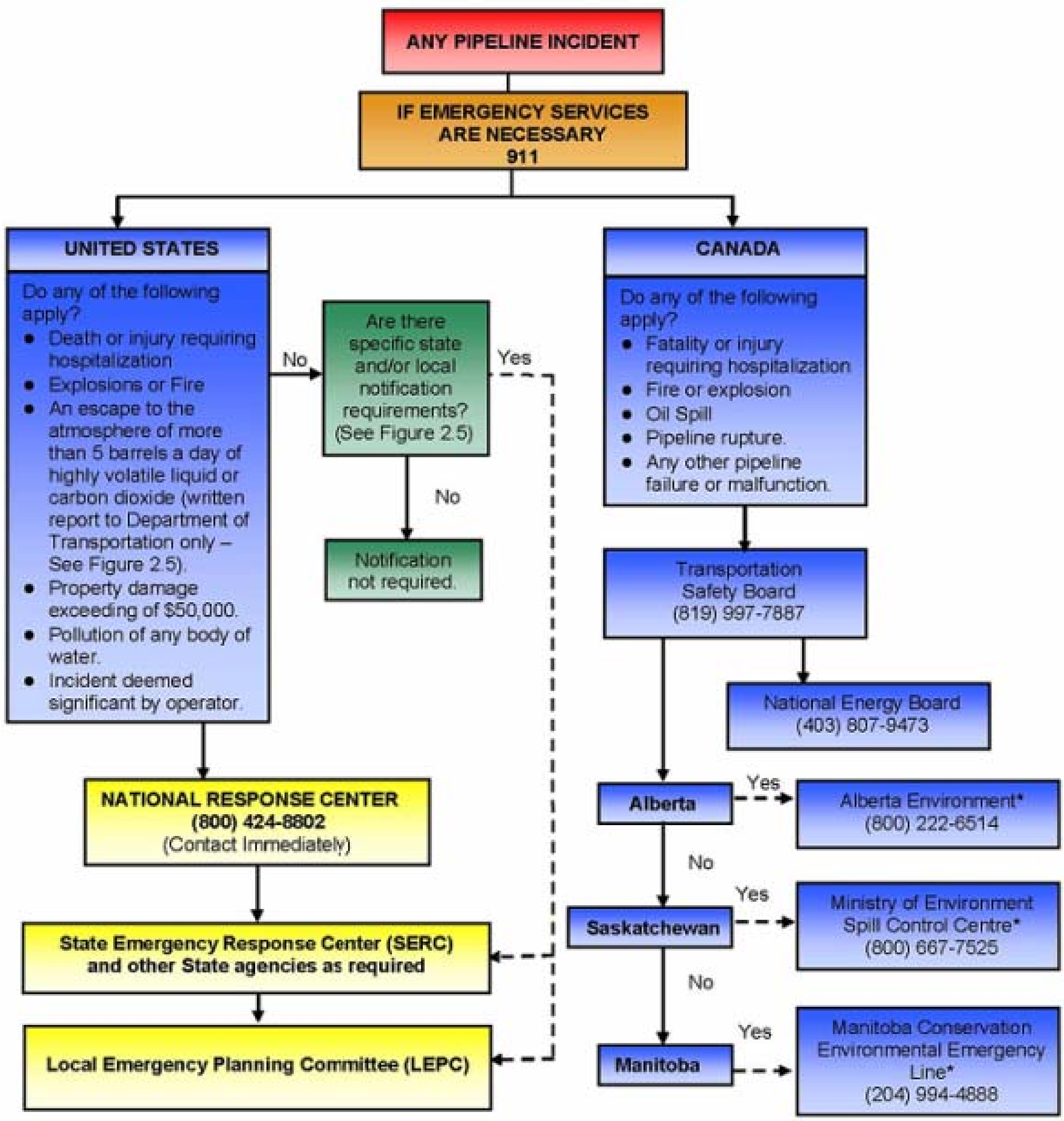


FIGURE 1.5
EXTERNAL NOTIFICATION REFERENCES

U.S. Federal Notification Requirements

National Response Center (NRC) c/o United States Coast Guard (CG-3RPF-2), 2100 2nd Street Southwest - Room 2111-B Washington, District Of Columbia 20593-0001	(800) 424-8802 (202) 267-2180 (800) 337-7455
REPORTING REQUIREMENTS TYPE: Any discharge or sighting of oil on navigable waters. VERBAL: Immediate notification required (within 2 hours). WRITTEN: If an RQ limit is reached, refer to state requirements for written report requirements. NOTE: A call to the NRC must also be made for spills or releases of hazardous substances that meet or exceed their RQ >5 Gal.	

Office of Pipeline Safety and Hazardous Materials U.S. Department of Transportation 1200 New Jersey Avenue SE-E-22-321 Washington, District Of Columbia 20590	(202) 366-4000
REPORTING REQUIREMENTS TYPE: In addition to the reporting of accidents to the NRC as noted below, a written accident report PHMSA Form 7000-1. VERBAL: Call to the NRC meets the required verbal notification under DOT reporting requirement. WRITTEN: Reported on PHMSA Form 7000-1 no later than 30 days, submit a report resulting from explosion/ fire/hospitalization, death, property damage greater than $50,000, or above reportable quantity. NOTE:	

U.S. Environmental Protection Agency, Region 8 999 18th Street Suite 500 Denver, Colorado 80202-246	(303) 312-6312
REPORTING REQUIREMENTS TYPE: Immediately for spills that impact or threaten navigable water or adjoining shoreline. VERBAL: Notification to the EPA is typically accomplished by the call to the NRC. WRITTEN: In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 bbls.) in a single event or two spill events within a twelve month period into or upon nav. water NOTE:	

U.S. Environmental Protection Agency, Region 5 77 W. Jackson Blvd., 5th Floor Chicago, Illinois 60604	(312) 353-2318 (312) 353-2000
REPORTING REQUIREMENTS TYPE: Any oil discharge that has impacted or threatens to impact navigable waters or release of hazardous substances in an amount equal or greater than the reportable quantity. VERBAL: Notification to the EPA is typically accomplished by the call to the NRC. WRITTEN: For oil discharge within 60 days, in accordance with applicable SPCC RQ. NOTE:	

U.S. Environmental Protection Agency, Region 6 1445 Ross Avenue, Suite 1200 Dallas, Texas 75202	(214) 665-6595 (214) 665-2222 (866) 372-7745
REPORTING REQUIREMENTS TYPE: Immediately for all spills that impact or threaten navigable water or adjoining shoreline. VERBAL: Notification to the EPA is typically accomplished by the call to the NRC. WRITTEN: As the agency may request depending on circumstances. NOTE:	

Canadian Federal Notification Requirements

Transportation Safety Board (TSB) of Canada 200 Promenade du Portage, Place du Centre, 4th Floor Gatineau, Quebec 1K8	(819) 997-7887 (800) 387-3557
REPORTING REQUIREMENTS TYPE: All pipeline accidents with fatality or serious injury, fire or explosion, oil spill, pipeline rupture or any other pipeline failure or malfunction. VERBAL: Immediately. WRITTEN: Within 30 days. NOTE:	

Canadian National Energy Board (CA NEB) 444 Seventh Avenue SW Calgary, Alberta T2P OX8	(403) 807-9473 (800) 899-1265
REPORTING REQUIREMENTS TYPE: All spills or discharges. VERBAL: Immediately. WRITTEN: As requested by the Agency. NOTE:	

U.S. State Notification Requirements

South Dakota Department of Environment and Natural PMB 2020 Joe Foss Building, 523 East Capitol Pierre, South Dakota 57501-3182	(605) 773-3151
REPORTING REQUIREMENTS TYPE: All spills or discharges VERBAL: Immediately. WRITTEN: As requested by the Agency. NOTE:	

Game, Fish and Parks South Dakota	(605) 345-3381
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota DENR, Div of Environmental Services 523 East Capitol Ave. Pierre, South Dakota 57501-3182	(605) 773-3296 (605) 773-3231
REPORTING REQUIREMENTS TYPE: Any Spill or discharge greater than reportable quantity. VERBAL: Immediately. WRITTEN: Within 30 days. NOTE:	

South Dakota DENR, Division of Oil and Gas South Dakota	(605) 394-2229
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota Department of Environment and Natural South Dakota	(605) 773-6035
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota Department of Transportation, RR	(605) 773-3046 (605) 773-3921
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota Department of Transportation, ROW South Dakota	(605) 773-3710 (605) 773-4249
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota Division of Emergency Management South Dakota	(605) 773-3231
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

South Dakota Public Utilities Commission South Dakota	(605) 773-3201
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Department of Environmental Quality 1200 N Street Suite 400 / PO Box 98922 Lincoln, Nebraska 68509-8922	(402) 471-2186 (402) 471-4545
REPORTING REQUIREMENTS TYPE: Any Discharge that leaves the Facility or threatens to impact navigable waters. VERBAL: Immediately, but not longer than 30 minutes. WRITTEN: As Requested by the Agency NOTE:	

Nebraska Emergency Management Agency Lincoln, Nebraska	(402) 471-7176
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Nebraska Game & Parks Commission Lincoln, Nebraska	(402) 471-5423 (402) 271-5440
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Department of Natural Resources Nebraska	(402) 494-2363
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Oklahoma Department of Environmental Quality 707 N Robinson Oklahoma City, Oklahoma 73102	(405) 702-1000
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Texas Rail Road Commission / Oil and Gas Division 1701 N. Congress / P.O. Box 12967 Austin, Texas 78711-2967	(512) 463-6788 (915) 684-5581
REPORTING REQUIREMENTS TYPE: (16 TAC Section 3.20 (a)-(b)) In the case of a fire, spill or break causing loss of over (5) barrels. For Pipeline incidents reportable to the NRC, notify the TRRC Pipeline Safety Section's District VERBAL: Immediate notification to District Office WRITTEN: File Form H-8 in duplicate when appropriate measure have been taken, within 30 days following the date of the incident. NOTE:	

Texas Commission on Environmental Quality 2800 S IH 35, Suite 100 Austin, Texas, 78704	(512) 463-7727 (713) 767-3500 (713) 767-3563
REPORTING REQUIREMENTS TYPE: All spills of oil or petroleum products into water and/or discharges onto land that meet or exceed 5 barrels VERBAL: As soon as possible, within 24 hours of discovery. WRITTEN: As the agency may request, depending on circumstances. NOTE:	

Montana Department of Environmental Quality	(406) 444-1420 (406) 841-3911
REPORTING REQUIREMENTS TYPE: Releases must be reported to the DEQ within 24 hours of being detected as required by ARM 17.56.501. VERBAL: Within 24 hours. Call the Leak Line at 1-800-457-0568, or after hours at (406) 841-3911.. WRITTEN: NOTE:	

State of Montana Department of Natural Resources	(406) 586-3136
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Canadian Provincial Notification Requirements

Alberta Environment 9915 -108 Street 10th Floor, Petroleum Plaza South Tower Edmonton, Alberta T5K 2G8	(800) 222-6514
REPORTING REQUIREMENTS TYPE: All spills to water or exceeds a reportable quantity or emission level. VERBAL: Immediately. WRITTEN: Within 7 days. NOTE:	

Saskatchewan Environment and Resource Management Box 3003, 800 Central Avenue. Prince Albert, Saskatchewan S5V 6G1	(800) 667-7525
REPORTING REQUIREMENTS TYPE: Any oil spill to water or oil spill greater than or equal to 50 L. to land. VERBAL: Immediately WRITTEN: Within 7 days. NOTE:	

LOCAL EMERGENCY AGENCIES	
Montana	
Phillips County LEPC	(406)-654-2350
Valley County LEPC	(406) 228-6224
McCone County LEPC	(406)-485-2347
Dawson County LEPC	(406)-377-2361
Prairie County LEPC	(406)-635-5738
Fallon County LEPC	(406) 778-3223
Carter County LEPC	(406)-975-6416
South Dakota	
Harding County LEPC	(605) 375-3414
Butte County LEPC	(605) 892-4205
Perkins County LEPC	(605) 244-5243
Meade County LEPC	(605) 347-4222
Pennington County LEPC	(605) 394-2185
Haakon County LEPC	No number listed
Jones County LEPC	(605) 669-2362
Lyman County LEPC	(605) 869-2200
Tripp County LEPC	(605) 842-2306
Nebraska	
Keya Paha County LEPC	(402)- 376-2420
Holt County LEPC	(402)-336-4126
Garfield County LEPC	No number listed
Wheeler County LEPC	No number listed
Greeley County LEPC	No number listed
Boone County LEPC	(402)-395-6525
Nance County LEPC	(308)-536-2452

Merrick County LEPC	(308)-946-2345
Hamilton County LEPC	(402)-694-5155
York County LEPC	(402)-363-2675
Fillmore County LEPC	(402)-759-4914
Saline County LEPC	(402)-821-3010
Jefferson County LEPC	(402)-656-3615

Oklahoma	
Lincoln County LEPC	(405)-258-1285
Creek County LEPC	(918)-367-9489
Okfuskee County LEPC	(918)-623-1122
Seminole County LEPC	(405)-382-2499
Hughes County LEPC	(405)-379-2203
Coal County LEPC	(580)-927-2121
Atoka County LEPC	(580)-889-2221
Bryan County LEPC	(580)-924-3737
Texas	
Fannin County LEPC	(903)-583-2143
Lamar County LEPC	(903)-737-2400
Delta County LEPC	(903)-395-2146
Hopkins County LEPC	(903)-438-4040
Franklin County LEPC	(903)-537-4539
Wood County LEPC	(903)-763-5461
Upshur County LEPC	(903)-843-2541
Smith County LEPC	(903)-590-2653
Cherokee County LEPC	(903)-683-5947
Rusk County LEPC	(903)-657-3581
Nacogdoches County LEPC	(409)-560-7793
Angelina County LEPC	(936)-634-3331
Polk County LEPC	(936)-327-6810
Liberty County LEPC	(936)-336-4525
Hardin County LEPC	(409)-246-5100
Jefferson County LEPC	(409)-835-8411
Orange County LEPC	(409)-883-2612

ADDITIONAL RESPONSE RESOURCES

Planning and Incident Support

COMPANY	LOCATION	TELEPHONE
National Response Corporation	3500 Sunrise Hwy Ste. T103 Great River, New York 11739	(800) 899-4672
O'Brien's Response Management Inc.	Slidell, Louisiana	(985) 781-0804
ENSR Corporation	Fort Collins, Colorado	(800) 722-2440
Western Canadian Spill Services Co-op	Calgary, Alberta	(403) 250-9606
Saskatchewan Co-op Area 1 Chairman	Saskatchewan	(780) 573-7350
Saskatchewan Co-op Area 1 Alt. Chairman	Saskatchewan	(306) 387-6449
Saskatchewan Co-op Area 2 Chairman	Box 1132 Kindersley, Saskatchewan S0L 1S0	(306) 968-2503
Saskatchewan Co-op Area 2 Co-Chairman	Box 5 Coleville, Saskatchewan S0L 0K0	(306) 965-2731
Saskatchewan Co-op Area 2 Custodian	Saskatchewan	(306) 834-7898
Saskatchewan Co-op Area 3 Chairperson	Saskatchewan	(306) 773-0234
Saskatchewan Co-op Area 3 Secretary	Saskatchewan	(306) 773-9381
Saskatchewan Co-op Area 3 Custodian	Saskatchewan	(306) 672-3723
Saskatchewan Co-op Area 4&5 Chair	Saskatchewan	(306) 842-1818
Saskatchewan Co-op Area 4&5 Vice-Chair	Saskatchewan	(306) 842-3088
Saskatchewan Co-op Area 6 Call-out	Saskatchewan	(306) 791-5058
Albert Coop Area 1S Regional Custodian	Lethbridge, Alberta	(403) 329-0427
Alberta Coop Area 1S Equip. Custodian	Brooks, Alberta	(403) 362-6551
Alberta Coop Area 2U Custodian	Hardisty, Alberta	(780) 888-3845
Euroway Industrial Svc Co. Ltd	Winnipeg, Manitoba	(204) 661-0500

SECTION 2

RESPONSE ACTIONS

2.1 INITIAL RESPONSE ACTIONS

Initial response actions are those taken by local personnel immediately upon becoming aware of a discharge or emergency incident, before the Initial Response Team (described in Section 3.0) is formed and functioning. Timely implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

The pages that follow discuss initial response actions for a variety of emergencies that have the possibility of occurring. These emergencies are discussed in the order listed below:

- Initial Response
- Line Break or Leak
- Fire
- Severe Thunderstorm/Flash Flooding/Landslide
- Tornadoes
- Earthquake
- Winter Storm
- Volcanic Eruptions
- Bomb Threat
- Release to Groundwater
- Abnormal Operations

It is important to note that these actions are intended only as guidelines. The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note that without exception, employees and public safety is first priority.

The first Company person on scene will function as the Incident Commander (IC) until relieved by an authorized supervisor who will assume the IC position. Transfer of command will take place as more senior management respond to the incident. The role of IC will typically be assumed and retained by area management.

The person functioning as Incident Commander during the initial response period has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.

INITIAL RESPONSE ACTIONS -SUMMARY PERSONNEL AND PUBLIC SAFETY IS FIRST PRIORITY			
RESPONSE TIMES*			
US DOT Tier	1	2	3
High Volume Area	6 HR	30 HR	54 HR
All Other Areas	12 HR	36 HR	60 HR

CONTROL
- **Eliminate sources of ignition**
- **Isolate the source of the discharge, minimize further flow**

NOTIFY
- **Make internal and external notifications**
- **Activate local Company personnel as necessary**
- **Activate response contractors and other external resources as necessary**

CONTAIN
- **Begin spill mitigation and response activities**
- **Monitor and control the containment and clean-up effort**
- **Protect the public and environmental sensitive areas**

* Response resources and personnel available to respond within time specified after discovery of a worst case discharge per US DOT 49 CFR Part 194.115

In addition to the potential emergency events outlined in this Section, the Company has identified several "abnormal operations" that could be expected in the pipeline facilities. The Company has defined the events and established procedures to identify, eliminate or mitigate the threat of a worst case discharge due to these events. In compliance with 49 CFR 195.402(d), these procedures are defined in the Company's Operations Manual.

FIRST COMPANY PERSON NOTIFIED / ON SCENE

- Verify emergency exists.
- Follow the appropriate "Specific Incident Response Checklist" in Figure 2.2 and "Product Specific Response Considerations" in Figure 2.3.
- Notify the Oil Control Center of the incident.
- Contact / Utilize local emergency services as necessary (police, fire, medical).

REGIONAL EMERGENCY OPERATION CENTER

- Ensure local emergency agencies have been contacted (police, fire, medical).
- Assign personnel immediately to the discharge site to assist with emergency response (QI) and spill containment.
- Activate additional company and response contractors to site as situation demands.
- Confirm safety aspects at site, including need for personal protective equipment, sources of ignition, and potential need for evacuation.
- Evaluate the severity, potential impact, safety concerns and response requirements based on the initial data provided by the first person on scene. Refer to the spill response evaluation Flowchart in this section.
- Perform notifications using Figure 1.1 as appropriate.

AREA MANAGEMENT -EMERGENCY SITE MANAGEMENT

- Proceed to spill site and coordinate response and clean-up operations.
- Assume the role of Incident Commander.
- Coordinate/perform activation of additional spill response contractors, as the situation demands (telephone reference is provided in Figure 1.5).
- Direct containment, dispersion, and/or clean-up operations in accordance with the "Product Specific Response Considerations" provided in Figure 2.3.
- Complete the "Product Release Report".

LOCAL COMPANY PERSONNEL

- Assigned personnel will immediately respond to a discharge from the Pipeline or Facility, as the situation demands.
- Assist as directed at the spill site.

FIGURE 2.1
SPILL CLASSIFICATION

<u>Spills/Releases to Environment</u>:

Minor

- A spill/release, onsite, that poses no adverse affect to the environment nor impact neither to a water body nor to groundwater. The spill may or may not be reportable to a regulatory agency.

Serious

- A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment but no impact to a water body nor to groundwater.

Major

- A spill/release, onsite or off-site/off ROW, that poses an adverse affect to the environment including an impact to a water body or to groundwater.

Critical

- Emergency response for containment or clean up is required. A spill/release, onsite or off-site/off ROW, that poses an adverse affect to the environment including an impact to a water body or to groundwater.

<u>Complaints -Health & Safety</u>:

Minor

- Unverified community complaint from a Landowner, Police, Fire, Municipality, or a Ministry. Verified employee complaint where an investigation is required to obtain resolution.

Serious

- Verified community complaint likely to cause danger/risk to the public, employees or TransCanada facilities.

Major

- Employee work refusal based on belief of unhealthy or unsafe work conditions.

Critical

- Regulatory body notified of employee complaint (by employee) and investigates employee work refusal.

FIGURE 2.2
SPECIFIC INCIDENT RESPONSE CHECKLIST

INITIAL RESPONSE

- Take appropriate personal protective measures.
- Secure site.
- Call for medical assistance if an injury has occurred.
- Notify the Oil Control Center and area management of the incident.
- Eliminate possible sources of ignition in the near vicinity of the spill.
- Take necessary fire response actions.
- Advise personnel or public in the area of any potential threat and/or initiate evacuation procedures.
- Identify/isolate the source and minimize the loss of product.
- Restrict access to the spill site and adjacent area as the situation demands. Take additional steps necessary to minimize any threat to health and safety.
- Verify the type of product and quantity released. (Material Safety Data Sheet(s) are available).

All personnel are reminded that outsiders other than emergency services will not be allowed in the area during the time of an emergency and that statements issued to the media or other interested parties should be given by designated Company Management. Be courteous with media representatives and direct them to the designated spokesperson.

LINE BREAK OR LEAK, SPECIFIC RESPONSE (Including Piping Rupture/ Leak Valve Rupture/Leak and Manifold Failure)

- Shut down Pipeline.
- Close upstream and downstream block valves.
- Mitigate spreading of the product, as the situation demands. See Release to Groundwater, Specific Response for more detailed information. Potential containment land-based strategies include:
    - o Earthen dike/berm
    - o Ditching
    - o Spreading sorbent material over the spill
- Prevent the spill from entering the waterways, sewer, etc. to the greatest extent possible.
- Determine the direction and expected duration of spill movement. Refer to the maps in this plan.
- Review the location of socio-economic and environmentally sensitive areas identified in this plan and the Area Contingency Plan (ACP). Determine which of these may be threatened by the spill and direct the response operation to these locations. Initiate protection and recovery actions.
- Response contractor under TransCanada direction utilizes Combustible Gas Indicator, Oxygen meter, proper colormetric indicator tubes and/or other air sampling measurements to assure that areas are safe to enter for continued response operations. Refer to Vapor Cloud Specific Response, later in this Figure, if flammable vapors are detected.
- Drain the line section, as the situation demands.
- Inform local operators of utilities such as the power company, telephone company, railway.
- Clean up spilled product to eliminate any possible environmental problems. Be alert for underground cables.
- Make all necessary repairs.
- Return the line to service when repairs are complete, if or when approved.
- Complete follow-up and written reporting, as the situation demands.

FIRES (MINOR, MAJOR, EXPLOSION) SPECIFIC RESPONSE

Be aware of Fire Weather conditions.

- Watch -Critical fire weather conditions are forecast to occur.
- Red Flag Warning -Critical Fire weather conditions are either occurring or will shortly.

INDIVIDUAL DISCOVERING THE FIRE - (All Employees)

Call the Local Emergency Response Agency (911).

Note: Pipeline right-of-ways are used by Firefighters as a fire break (barrier) to isolate fires and prevent them from growing in size. Right-of-ways are commonly used to access to fire areas. Many times Firefighters will need to increase the size of the cleared space over the Pipeline right-of-way to prevent the fire from leaping from tree top to tree top. To do this, heavy equipment may be used to quickly increase the amount of cleared space between the fire area and unignited forest. The following are steps to consider when working with the local authority on creating these fire breaks.

- Use your best judgment to ensure the safety of staff, fire ground workers and the public when determining if this activity is safe to perform;
- Call and confirm with Asset Reliability if this activity is safe and implement any instructions provided by Asset Reliability. Asset Reliability's role is to provide directions to protect the health and safety of those involved as well as pipeline integrity;
- Be physically on site to coordinate the activities related to any pipeline crossings;
- Stake the pipeline to identify the location of the pipe(s) in the right-of-way.
- First preference is to use already existing pipeline crossing areas;
- Gather the appropriate information to complete a formal pipeline crossing agreement. In Canada, send required information to the Land Department in Calgary.
- Notify the Oil Control Center and area management.
- Shut off pumps.
- Coordinate with the Oil Control Center to close appropriate valves to isolate fire, if necessary.
- Isolate Pump Station from Mainline.
- Evacuate site as safety considerations dictates.
- Notify the Oil Control Center of evacuation route and final destination.
- Notify the Oil Control Center of safe arrival.
- Inspect pump station, equipment and controls after the fire is extinguished and safe to return.
- Evaluate pipeline, monitoring or control systems for evidence of heat damage.
- Notify engineering to conduct further investigation if damage is found.
- Make appropriate repairs and return Pipeline to service.

SEVERE THUNDERSTORM (Flash Flooding/Landslide) SPECIFIC RESPONSE

Thunderstorms are a year round occurrence with lightning a major threat. The potential of flash flooding is also possible when one area is affected for an extended period.

- Be aware of changing weather conditions.
  - Severe Thunderstorm Watch -Conditions are favorable to the development of thunderstorms.
  - Severe Thunderstorm Warning -A severe thunderstorm has been observed or is imminent.
  - Flash Flood Watch-Flash flooding is possible within 6 hours after heavy rains have ended.
  - Flash Flood Warning -Flash flooding is occurring or imminent.
- Terminate outdoor work when lightning is occurring and move to shelter.
- Avoid areas subject to sudden flooding until the thunderstorm passes.
- Evaluate the situation after weather event.
  - Does standing water prevent visual inspection?
  - Have flood waters damaged the Pipeline?
  - Have flood waters exposed buried piping?
  - Has soil shifted that could lead to a landslide?
- Initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs.

TORNADO/STRAIGHT LINE WINDS SPECIFIC RESPONSE

Although many disasters cannot be prevented or predicted, preparation can significantly reduce losses. In the event of a severe weather condition or a natural disaster, the Area Manager or assigned designee will be the Emergency Coordinator.

- **Be Aware of Changing Weather Conditions**
  - Tornado watch -Conditions are right for the formation of a tornado.
  - Tornado warning -A tornado has been sighted but is not in the area at this time.
  - Tornado alert -A tornado has been sighted in the immediate area, take cover immediately.
- **If Severe Weather Conditions Threaten**
  - Carry a battery operated portable radio and monitor conditions.
  - If a tornado is observed and time permits, evacuate the area.
  - If the tornado is approaching a pump station, notify the Oil Control Center to remotely isolate the station.
  - In vehicle, drive away from tornado at right angle. Get out of car and seek shelter if tornado cannot be avoided.
  - If outdoors, shelter in ditch, excavation or other low spot and lie flat, face down.
  - Make certain that all personnel are aware of the condition.
  - Stay in shelter until conditions are safe.
- **Immediately After the Storm**
  - Account for all personnel.
  - Survey for damages.
  - Initiate team for any repairs.
  - Refer to this Plan for additional response guidance regarding fires, spills, etc., as needed.

EARTHQUAKE SPECIFIC RESPONSE

The actual movement of the ground in an earthquake is rarely the direct cause of death or injury. Most casualties result from falling objects and debris because the shocks can shake, damage or demolish buildings and other structures.

- **Stay calm. Don't panic.**
- If you are indoors, stay there. Do not run outside.
- If you are in a building, take cover under a heavy furniture or stand in an inside doorway away from windows. (A door frame or the inner core of a building is its strongest point and least likely to collapse.)
- Exit building as situation determines.
- If you are outside, stay there. Move away from buildings to avoid falling debris. Avoid damaged utility lines.
- If you are driving, stop quickly and stay in your car. If possible, do not stop on a bridge, overpass or where buildings can fall on you. Your car can provide protection from falling debris.
- Do not reenter damaged buildings. Walls may collapse after the original shaking has ceased.
- Evaluate the situation and initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs as resources and conditions allow.

SEVERE WINTER STORM SPECIFIC RESPONSE

- Be aware of Changing Weather Conditions
  - Winter Storm Watch -Conditions are expected but not imminent.
  - Winter Storm Warning -A significant winter storm is occurring, imminent, or likely.
  - Blizzard Warning -Winds at least 35 mph, blowing snow frequently reducing visibility to 0.25 miles or less, and dangerous wind chills are expected.
- Listen to local radio stations for weather advisory and road condition reports, carry a survival kit, and start the trip with a full tank of gasoline.
- Inspect pump station, equipment, and controls after storm for damage.
- Make any repairs as necessary.

VOLCANIC ERUPTIONS SPECIFIC RESPONSE

If a volcanic eruption ejects a large ash plume and the wind carries the ash to the pipeline facilities, this may cause a disruption of operations by making travel difficult or impossible due to reduced visibility.

- Begin gathering information from news media, field personnel, etc. to assess any ash cloud size, location, heading and speed as soon as news of an eruption breaks.
- Consider recalling crews prior to the expected arrival of the ash cloud while it is still clear to travel. If a crew is at a station when an ash fall begins, they should probably stay there for the duration and not travel until it is determined to be safe after the event.
- Advise contract aerial patrol service of the situation if contacted for the beginning of a pipeline patrol or if an aerial patrol is in progress.
- Inspect pump station, equipment and controls after eruption for damage.
- Make any repairs as necessary.

BOMB THREATS SPECIFIC RESPONSE

The following pages provide guidelines for actions to be taken in the event a bomb threat is received. A bomb threat to the pipeline system or personnel may present itself in any of several ways:

- Phone
- E-mail
- Fax
- Radio
- Mail
- Word-of-mouth
- Increase in the Homeland Defense Status

Other threats to pipeline system or personnel are often treated in the same manner as bomb threats. These may include:

- Terrorist threats
- Workplace violence threats
- General threat to an industry
- Civil disturbances

The following steps should be used as guidance when responding to the above situations. Actions during a real event will vary based on differences in circumstances, response activities, good judgment, etc.

PHONE / WRITTEN (Fax, Letter, Telegram) THREATS

Person Receiving the Call

- Immediately open the Bomb Threat form, (this should be kept next to the phone), so you can use it during the conversation with the individual making the bomb threat call. If possible, complete the form during the call.
- Remain calm and be engaging when talking to the caller.
- Keep the caller on the line as long as possible in order to obtain as much information as possible. Ask him/her to repeat the message. Try to write down every word spoken by the person. If you have a small hand-held tape recorder available, try to tape the conversation.
- If the caller does not indicate the location of the bomb or the time of detonation/attack, ask for this information.
- Inform the caller that the incident could result in death or serious injury to innocent people.
- Pay particular attention to background noises, such as motors, music, and any other noise that may give a clue as to the location of the caller.
- Listen closely to the voice (male, female), voice quality (calm, excited), accents, and speech impediments.

AFTER THE CALLER HANGS UP AND WRITTEN THREATS

- Immediately report the threat call to the Oil Control Center or the Company person designated by management to receive such information.

Pipelines and Pump Stations -Additional Guidance

- If the caller does not indicate the location of the bomb / substance or the time of possible detonation/attack, ask him / her for this information. Try to determine the Provice / State, pipeline system, and specific location involved if possible.
- For offices and control center, inform the caller that the building/facility is occupied and the incident could result in death or serious injury to innocent people.
- For pipeline and pump stations, inform the caller that an incident could result in death of the innocent general public or significant environmental impact.

Area Manager/Designee

- Based upon discussion with Corporate Security, determine if the threat is credible. Then decide what actions to take, which can include:
  - Do Nothing
  - Attempt to determine which facility(s) are at risk
  - Stay and Search
  - Partial Evacuation or Internal Evacuation (offices or control center)
  - External Evacuation to an offsite Command Post (offices or control center)
- If a full or partial facility evacuation is necessary, activate Building Evacuation Plan immediately. When in doubt, evacuate. Encourage personnel to be vigilant for suspicious or out-of-place objects as they evacuate and leave their workstations.
- Initiate operations "shut down" procedures, as necessary.
- Secure the location and limit access to essential personnel only.
- Call the appropriate local and/or government agencies (fire, police, etc.) listed in Figure 1.5 and inform them of the threat and your Command Post location.
- Set up a Command Post at a pre-determined offsite location. Ensure you have:
  - Emergency Response Plan
  - Facility maps
  - Access keys
  - Cell Phones, Pagers & Radios
- Direct all members of the press to the designated spokesperson.

PIPELINES AND PUMP STATIONS SEARCH GUIDELINES

- Additional actions to consider taking upon credible threats against pipelines and pump stations:
  - Which if any system(s) should be shutdown
  - When any system(s) should be shutdown
- Survey from a distance with the aid of binoculars:
  - valves
  - station piping
- Due to the expanse of Pipeline facilities, aircraft should be considered to aid in the surveying pipeline ROW.
- Notify the appropriate local and/or government agencies listed in Figure 1.5 upon discovery of suspicious or out-of-place object(s).

SUSPICIOUS MAIL / DELIVERED PACKAGES

- Frequently seen explosive devices have been incorporated, hidden, or camouflaged in letters, soft cover pocketbooks, hard cover books, manila envelopes, and cardboard boxes. While many are delivered by Canadian or U.S. mail, they may arrive by private courier or express service. Be alert to recognize suspicious-looking or unexpected items especially those that have:
  - Special handling marks (special delivery, air mail, registered, certified)
  - Restrictive markings (personal, confidential, addressee only)
  - Excessive postage
  - Handwritten or poorly typed address
  - Incorrect title, or title but no names
  - Misspelling of common words
  - Oily stains, discolorations, or odor
  - No return address
  - Excessive weight
  - Lopsided, uneven, or ridged envelope
  - Protruding wires or tin foil
  - Excessive securing material (tape, string, etc.)
  - Any evidence that the envelope has been opened and re-glued
  - Mail item from a new or strange source

- If you receive or find a suspicious-looking letter or package:
  - o DO NOT TRY TO OPEN IT.
  - o Isolate the area around the letter or package to the degree possible, and make emergency notifications as previously outlined, and evacuate personnel to a safe distance, as directed.
  - o DO NOT MOVE NOR HANDLE unless absolutely necessary.
  - o If opened, preserve, BUT DO NOT TOUCH FURTHER all original envelopes, twine, shipping documents, or packaging materials for evidence and release to the police as requested.
  - o Report the call to the Regional Manager or their designee.

RELEASE TO GROUNDWATER SPECIFIC RESPONSE

- Evaluate the topography and evidence of surface contamination.
- Establish containment, accounting for public safety, spill volume, terrain, and presence of surface water.
- Notify landowner and appropriate public agencies of potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.
- Consult with appropriate agencies regarding remediation, including water and soil cleanup levels, and need for groundwater monitoring.
- Notify and procure additional response equipment and personnel as necessary to address site-specific conditions.
- Dig intercept trench downgradient of release point.
- Line trench and stage vacuum truck to remove contaminated oil/water mixture.
- Excavate surface catchment upgradient of the intercept trench and near leading edge of visible contamination.
- Excavate until contaminated soil is completely removed and clean soil is encountered or conditions prohibit continued digging.
- Line the catchment to limit or prohibit further groundwater contamination.
- Move vacuum truck from intercept trench to catchment to recover oil and/or oily water.
- Line drop down area to stage contaminated soil as excavated.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.

  Options for Long term Remediation:

  - Air sparging
  - Vacuum extraction
  - Conventional pump and treat
  - Bioslurping
  - Excavation
  - Enhanced biodegradation/bioremediation
  - Chemical addition/oxidation
  - Natural Attenuation
- Enlist additional experts, as appropriate, for continuing remediation and coordination with appropriate agencies.

ABNORMAL OPERATIONS SPECIFIC RESPONSE

- If operating design limits have been exceeded (increase or decrease pressure or flow) and no emergency condition exists, stop operations and immediately investigate the pipeline.
- Verify whether a true safety problem, equipment malfunction, or operator error is present. Note: In all cases, safety to operations, the general public, and property will govern actions taken.
- Make appropriate repairs before continuing operations. Note: Corrective action will only be done by qualified personnel to perform the type of work involved.
- Monitor affected systems until normal operations are resumed.
- Complete follow-up and written reporting, as the situation demands.

Note: It is the responsibility of the pipeline operator to carry out the response procedures for abnormal pipeline operations as outlined in their respective O&M Manual.

2.2 DOCUMENTATION OF INITIAL RESPONSE ACTIONS

It is difficult, particularly during the first few minutes of an initial response operation, to think about the importance of documentation. A log should be maintained which documents the history of the events and communications that occur during the response. When recording this information, it is important to remember that the log may become instrumental in legal proceedings, therefore:

- Record only facts, do not speculate.
- Do not criticize the efforts and/or methods of other people/operations.
- Do not speculate on the cause of the spill.
- Do not skip lines between entries or make erasures. If an error is made, draw a line through it, add the correct entry above or below it, and initial the change.
- Record the recommendations, instructions, and actions taken by government/regulatory officials.
- Document conversations (telephone or in person) with government/regulatory officials.
- **Request that government/regulatory officials document and sign their recommendations or orders (especially if company personnel do not agree with the suggestions, instructions, or actions).**

2.3 OIL CONTAINMENT, RECOVERY AND DISPOSAL/WASTE MANAGEMENT

After initial response has been taken to stop further spillage and notifications made to the required agencies, the Company will begin spill containment, recovery, and disposal operations.

The Incident Commander will assess the size and hazards of the spill (see Figure 2.3). The type of product, the location of the spill, and the predicted movement of the spill will be considered.

Based on this assessment, additional clean-up personnel and equipment will be dispatched to the site and deployed to control and contain the spill. Boom may be deployed in waterways to contain the spill and to protect socio-economic and environmentally sensitive areas. Booms may also be used in waterways to deflect or guide the spill to locations where it can more effectively be cleaned up using skimmers, vacuum trucks, or sorbent material. Clean-up equipment and material will be used in the manner most effective for rapid and complete clean-up of all spilled product.

Response and clean-up will continue until all recoverable product is removed, the environment is returned to its pre-spill state, and the Unified Command of the Company Incident Commander and the Federal and/or State On-Scene Coordinators determine that further response and cleanup is no longer necessary.

FIGURE 2.3

FLAMMABLE LIQUIDS (Non-Polar/Water-Immiscible)	
The following information is intended to provide initial responder(s) with data that may be useful in making quick decisions and executing prompt response actions. The information is intended for guideline purposes only.	
PRODUCTS: Crude Oil	
HAZARD IDENTIFICATION / RECOGNITION	
GUIDE NO. 128	**DANGERS** **1. HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.** **2. Vapors may form explosive mixtures with air.** **3. Vapors may travel to source of ignition and flash back.** **4. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).** **5. Vapor explosion hazard indoors, outdoors or in sewers.** **6. Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.** **7. Runoff to sewer may create fire or explosion hazard.** **8. Containers may explode when heated.** **9. Many liquids are lighter than water.** **10. Substance may be transported hot.** **11. If molten aluminum is involved, refer to Emergency Response Guide No. 169.**
HEALTH	
1. Move victim to fresh air. Call 911 or emergency medical service. 2. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. 3. Remove and isolate contaminated clothing and shoes. 4. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. 5. Wash skin with soap and water. 6. Keep victim warm and quiet. 7. Ensure that medical personnel are aware of the material(s) involved, and take precautions.	
PUBLIC SAFETY	
1. Isolate spill or leak area immediately for at least 50 meters (150 feet) in all directions. 2. Keep unauthorized personnel away. 3. Stay upwind. 4. Keep out of low areas. 5. Ventilate closed spaces before entering.	
EVACUATION	**Large Spill 1. Consider initial downwind evacuation for at least 300 meters (1,000 feet). Fire 1. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.**
Information provided by the Emergency Response Guidebook 2008.	

2.4 STORAGE/DISPOSAL

Strict rules designed to ensure safe and secure handling of waste materials govern the Company waste disposal activities. To ensure proper disposal of recovered oil and associated debris, the following guidelines should be considered:

- In the event of a product spill, Facilities have limited capacity to store recovered product and water. Separated product is pumped to frac tanks or to trucks to be carried to the Facility for processing.
- Oily debris will be segregated on site and containerized for temporary storage prior to disposal in accordance with hazardous waste regulations.
- Transportation of waste material will be performed in accordance with all applicable Federal and State Regulations.
- Waste associated with the spill will be disposed at sites that have the necessary permits to accept the type of waste to be discharged.

The Company's Community, Safety and Health Administration Dept. will coordinate activities and secure the permits to ensure proper disposal or recycling of recovered product and debris.

2.5 SAMPLING AND WASTE ANALYSIS PROCEDURE

The Company's sampling and waste analysis practices are governed by the regulations for the applicable Province/State and Federal agency. These regulations outline methods and procedures for determining the chemical and physical characteristics of wastes generated by the Facility, including waste associated with spills, so that they may be properly stored, treated, or disposed.

2.6 SAFETY AWARENESS

It is the corporate policy of the Company to provide a safe workplace for all workers. All employees and contractors are responsible for maintaining the safety and health of all workers on the pipeline and the response operations.

Prior to engaging in any spill response activity:

- All employees/contractors must have received orientation from the Company Safety Plan.
- All U.S. contractor response personnel must be in compliance with Occupational Safety and Health Administration training requirements.
- All other personnel will have completed appropriate training for their position as outlined in Section 3.0.
- No employee/contractor shall engage in activities which place them at risk without the appropriate protective equipment and training.

Response Safety

All Company and contractor personnel are expected to comply with the Site Safety Plan for each spill incident.

- Any concern regarding health or safety issues should be immediately addressed.
- The First Responder must consider the spill site as dangerous and the local atmosphere explosive until air monitoring procedures prove that the area is safe.
- The First Responder must exit the area against or across the wind, if possible, and must also evacuate others who are working in the area.
- All injuries, no matter how minor, must be reported to the Incident Commander in a timely manner.
- Prior to entering a spill area, a qualified person must perform an initial safety and health evaluation of the site.

Air Monitoring

A Safety Monitor shall be designated who is trained in the operation of air monitoring equipment. The Incident Commander must ensure that Safety Monitors are trained and that their equipment is maintained and ready for use.

- The air monitoring equipment shall be activated and checked at the location in which it is stored.
- Calibration of instruments should be performed before use.
- Air monitoring measurements which are to be made prior to entry into the spill area include:
  - Oxygen content
  - Lower Explosive Limit (LEL)
  - Benzene level
- Lower Explosive Limit readings above 10% require immediate evacuation of the area and elimination of ignition sources.
- Oxygen readings below 19.5% require the use of air supplied respiratory protection.
- After assuring that there are no hazards relating to explosion or oxygen depletion, sampling for benzene or total petroleum hydrocarbons shall dictate the appropriate respiratory devices to be used by persons entering the area.
- Benzene levels must be below .5 ppm to work without respiratory protection. At a level of greater the.5 but less than 10 ppm a half face repirator may be used. When the level is between 50 and 100ppm a full face repirator must be used. Anything readings higher than 50 ppm, a supplied air or SCBA must be used.
- Hydrogen Sulfide is an extremely hazardous toxic compound that is present in most crude oils that are transported through the pipeline.

- Passive air monitoring for Hydrogen Sulfide will be done by all personnel working on or near the pipeline and during any cleanup operation.
    - o Hydrogen Sulfide is characterized by a rotten egg smell.
    - o The gas causes rapid temporary paralysis of the olfactory system leading to the loss of the sense of smell.
    - o Permissible exposure limits in many countries is 10 ppm.
- Symptoms of exposure to Hydrogen Sulfide are:
    - o 0-10 ppm causes Irritation of the eyes, nose and throat
    - o 10-50 ppm can cause headache, dizziness, nausea, vomiting and breathing difficulty
    - o 50-100 ppm can cause severe respiratory irritation, shock, convulsions, coma and even death.
- The Incident Commander is responsible for industrial hygiene monitoring in the post discovery period.

Decontamination

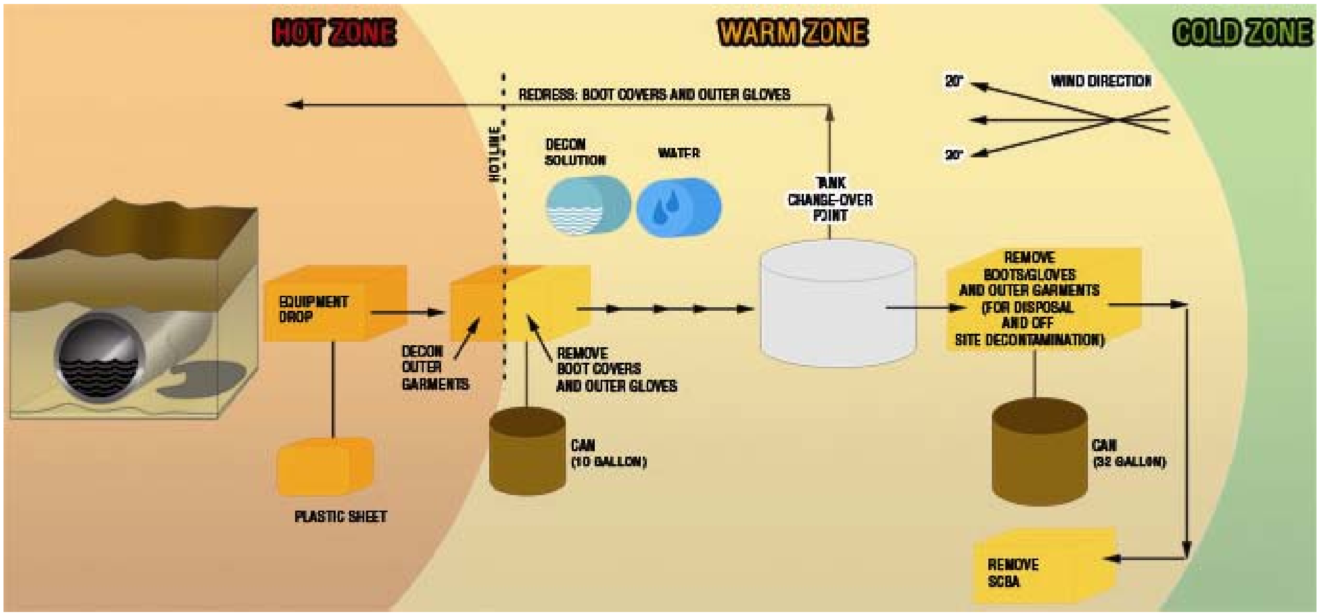
Through training programs, Facility personnel know and understand the importance of the removal of hazardous substances from their person if they are contaminated. Eyewash stations and safety showers provide a means to quickly remove gross contamination of harmful agents, including gasoline. Personnel must immediately shower and remove any clothing which is wet or otherwise contaminated. Showers in the change room are to be used for thorough cleansing. Persons should inspect themselves thoroughly before donning a fresh change of clothing.

Contaminated clothing should be properly disposed. Contaminated personal protective equipment must be washed and sanitized before re-using. The washing of contaminated equipment is performed in a "contained area" to assure that the disposal of the wash water can be handled properly.

Establishing "Exclusion -Hot", "Decontamination - Decon", and "Support -Safe" Zones are required to prevent the removal of contaminants from the contaminated area as well as unauthorized entry into contaminated areas.

- Regardless of the decontamination facilities available, all efforts to minimize personnel exposure should be taken.
- Decontamination facilities should be positioned prior to employee/ contractor entrance to areas where the potential for exposure to contamination exists. The appropriate Material Safety Data Sheets (MSDS) are available to aid health professionals treating the injured parties. Material Safety Data Sheets are located in Appendix G.
- Decontamination facilities should be designed to prevent further contamination of the environment and should have a temporary storage area for items that will be reused in the contaminated area.
- Particular attention should be paid to personal hygiene prior to eating, drinking, or smoking.

MINIMUM DECONTAMINATION LAYOUT
LEVELS A & B PROTECTION



Personal Protective Equipment (PPE)

The following represents OSHA/USEPA designated PPE levels for responding to emergencies, post emergency cleanup sites, and/or Temporary Storage and Disposal (TSD) sites. The responder's PPE should be chosen based on his/her level of training and assigned job duties.

Personal Protective Equipment (PPE)	
<u>LEVEL A</u> ● **Self Contained Breathing Apparatus (SCBA) (worn inside suit)** ● **Encapsulated Chemical Protective Suit ● Chemical Protective Gloves** ● **Chemical Protective Boots** ● **Hard Hat** ● **Safety Toe Footwear** ● **Safety Glasses**	To be selected when the greatest level ok skin, respiratory, and eye protection is required.
<u>LEVEL B</u> ● **SCBA (worn outside suit)** ● **Chemical Protective Suit w/Hood** ● **Chemical Protective Boots** ● **Chemical Protective Gloves** ● **Hard Hat** ● **Safety Toe Footwear** ● **Safety Glasses**	To be selected when the highest level of respiratory protection is necessary but a lesser level ok skin is needed.
<u>LEVEL C</u> ● **Air Purifying Respirator (APR)** ● **APR a½ Face / Full Face** ● **Hard Hat** ● **Glasses (worn with a½ face APR)** ● **Chemical Protective Boots** ● **Chemical Protective Gloves** ● **Chemical Protective Suit/Tyvek** ● **Safety Toe Footwear** ● **Safety Glasses**	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
<u>MODIFIED LEVEL C</u> **Same as Level C, except no APR requirements.**	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
<u>LEVEL D</u> ● **Hard Hat** ● **Safety Glasses** ● **Work Uniform / Clothes** ● **Leather Gloves** ● **Safety Boots** ● **Nomex (if required by the Company)**	The atmosphere contains no known hazard and work functions preclude the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

2.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Call 911 immediately. On-site emergency medical response requires the same rapid assessment of the patient as any other situation, but requires the responders to be aware of other considerations that may affect the way they handle the patient. These considerations include the following:

- The potential for contamination of the patient, responders, and equipment should be addressed. Responders should arrange to treat all patients AFTER the injured party has been decontaminated according to the Site Safety Plan.
- Site personnel should make the initial assessment of the patient and determine the severity of the injury/illness.
- If the treatment needed is critical care or "life saving" treatment, rapid decontamination of the injured/ill party should be started. Refer to the Site Safety Plan for steps to be taken in an "abbreviated" decontamination for medical treatment.
- The need for full decontamination should be carefully weighed against the need for prompt medical treatment.
- The ambulance responding to medical emergencies shall be contacted as soon as possible and instructed exactly where to respond when needed and the nature of the contaminant. Telephone reference is provided in Annexes.
- Material Safety Data Sheet information will be available from the Incident Commander and should be provided to medical personnel to alert them of decontamination requirements.
- Report all injuries, incidents or close calls.
- If emergency medical treatment is needed, the Incident Commander, or his designated representatives, will request assistance from trained medical personnel.

SECTION 3

RESPONSE TEAMS

3.1 INTRODUCTION

This Section describes organizational features and duties of the local responders, the Regional Emergency Preparedness Team (EPT), and the broader Emergency Management Team (EMT) as defined in TransCanada's Incident Management System (IMS). The Incident Management System integrates Incident Management, Emergency Management and Crisis Management and is maintained separately.

The key to an effective emergency response is a rapid, coordinated, tiered response by the affected Facility, the Regional Emergency Operations Center, and the Corporate Emergency Operations Center, consistent with the magnitude of an incident.

First response to an incident at the Facility will be provided by the local responders. The Regional EOC will respond, to the degree necessary, to incidents exceeding local capability.

Our response teams will use the National Incident Management System (NIMS) Incident Command System (ICS) to manage the emergency response activities. Because Incident Commander System is a management tool that is readily adaptable to incidents of varying magnitude, it will typically be used for all emergency incidents. Staffing levels will be adjusted to meet specific response team needs based on incident size, severity, and type of emergency.

An explanation of Incident Commander System and the roles and responsibilities for primary members of the response teams are provided in Section 3.7 per CAN/CSA-2731-03. The USCG Incident Management Handbook (IMH) contains an in-depth description of all Incident Commander System positions, Incident Commander System development, response objectives and strategies, command responsibilities, Incident Commander System specific glossary/acronyms, resource typing, the Incident Action Plan process, and meetings. The IMH can be located on the USCG's Homeport Website.

3.2 QUALIFIED INDIVIDUAL

It is the responsibility of the Qualified Individual (QI) or his/her designee to coordinate with the Federal On-Scene Coordinator (FOSC) and State On-Scene Coordinator (SOSC) throughout the response, if applicable.

Vital duties of the Qualified Individual (QI) include:

- Notify all response personnel, as needed.
- Identify the character, exact source, amount, and extent of the release, as well as the other items needed for notification.
- Assess the interaction of the spilled substance with water and/or other substances stored at the Facility and notify response personnel at the scene of that assessment.

- Assess the possible hazards to human health and the environment due to the release. This assessment must consider both the direct and indirect effects of the release (i.e., the effects of any toxic, irritating, or asphyxiating gases that may be generated or the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosion).
- Assess and implement prompt removal actions to contain and remove the substance released.
- Coordinate rescue and response actions as previously arranged with all response personnel.
- Activate and engage in contracting with oil spill removal organizations.
- Use authority to immediately access Company funding to initiate cleanup activities.
- Direct cleanup activities until properly relieved of this responsibility.
- Arrangements will be made to ensure that the Qualified Individual (QI) or the Alternate Qualified Individual (AQI) is available on a 24-hour basis and is able to arrive at the Facility in a reasonable time.
- The AQI shall replace the QI in the event of his/her absence and have the same responsibilities and authority.

3.3 INITIAL RESPONSE TEAM (IRT)

The first Company person on scene will function as the Incident Commander and person-in-charge until relieved by an authorized supervisor who will then assume the position of Incident Commander (IC). Transfer of command will take place as more senior management contract support respond to the incident. For response operations within the control of the Initial Response Team, the role of IC will typically be assumed and retained by the Qualified Individual.

The number of positions/personnel required to staff the Initial Response Team will depend on the size and complexity of the incident. The duties of each position may be performed by the IC directly or delegated as the situation demands. The IC is always responsible for directing the response activities and will assume the duties of all the primary positions until the duties can be delegated to other qualified personnel.

A complete functional ICS organization is shown in Figure 3.1. The Initial Response Team should try to fill the necessary positions and request additional support from the Crisis Response Team to fill/back up all the positions as the incident may dictate. Detailed job descriptions of the primary response team positions are provided in Section 3.7.

3.4 REGIONAL EMERGENCY PREPAREDNESS TEAM (EPT)

The Emergency Preparedness Team (EPT) supports the Initial Response Team. The number of positions/personnel required to staff the EPT will depend on the size and complexity of the incident.

The Regional Emergency Preparedness Team is staffed by personnel from various Regional locations. The EPT provides necessary information to the appropriate Federal, State/Province, and Local authorities with designated response roles, including the National Response Center (NRC), the Canadian National Energy Board (NEB), if necessary, State Emergency Response Commission (SERC) Provincial Ministry, and local response agencies.

3.5 INCIDENT COMMAND SYSTEM (ICS)

The Incident Command System is intended to be used as an emergency management tool to aid in mitigating all types of emergency incidents. This system is readily adaptable to very small emergency incidents as well as more significant or complex emergencies. The Incident Command System utilizes the following criteria as key operational factors:

- Assigns overall authority to one individual
- Provides structured authority, roles and responsibilities during emergencies
- The system is simple and familiar, and is used routinely at a variety of incidents
- Communications are structured
- There is a structured system for response and assignment of resources
- The system provides for expansion, escalation, and transfer/transition of roles and responsibilities
- The system allows for "Unified Command" where agency involvement at the command level is required

Effective establishment and utilization of the Incident Command System during response to all types of emergencies can:

- Provide for increased safety
- Shorten emergency mitigation time by providing more effective and organized mitigation
- Cause increased confidence and support from local, State, Federal, and public sector emergency response personnel
- Provide a solid cornerstone for emergency planning efforts

Section 3.7 provides a comprehensive list of every response team member’s duty assignment.

3.6 UNIFIED COMMAND

As a component of an Incident Commander System, the Unified Command (UC) is a structure that brings together the Incident Commanders of all major organizations involved in the incident to coordinate an effective response while still meeting their own responsibilities. The Unified Command links the organizations responding to the incident and provides a forum for the Responsible Party and responding agencies to make consensus decisions. Under the Unified Command, the various jurisdictions and/or agencies and responders may blend together throughout the organization to create an integrated response team. The Incident Commander System process requires the Unified Command to set clear objectives to guide the on-scene response resources.

Multiple jurisdictions may be involved in a response effort utilizing Unified Command. These jurisdictions could be represented by any combination of:

- Geographic boundaries
- Government levels
- Functional responsibilities
- Statutory responsibilities

The participants of Unified Command for a specific incident will be determined taking into account the specifics of the incident and existing response plans and/or decisions reached during the initial meeting of the Unified Command. The Unified Command may change as an incident progresses, in order to account for changes in the situation.

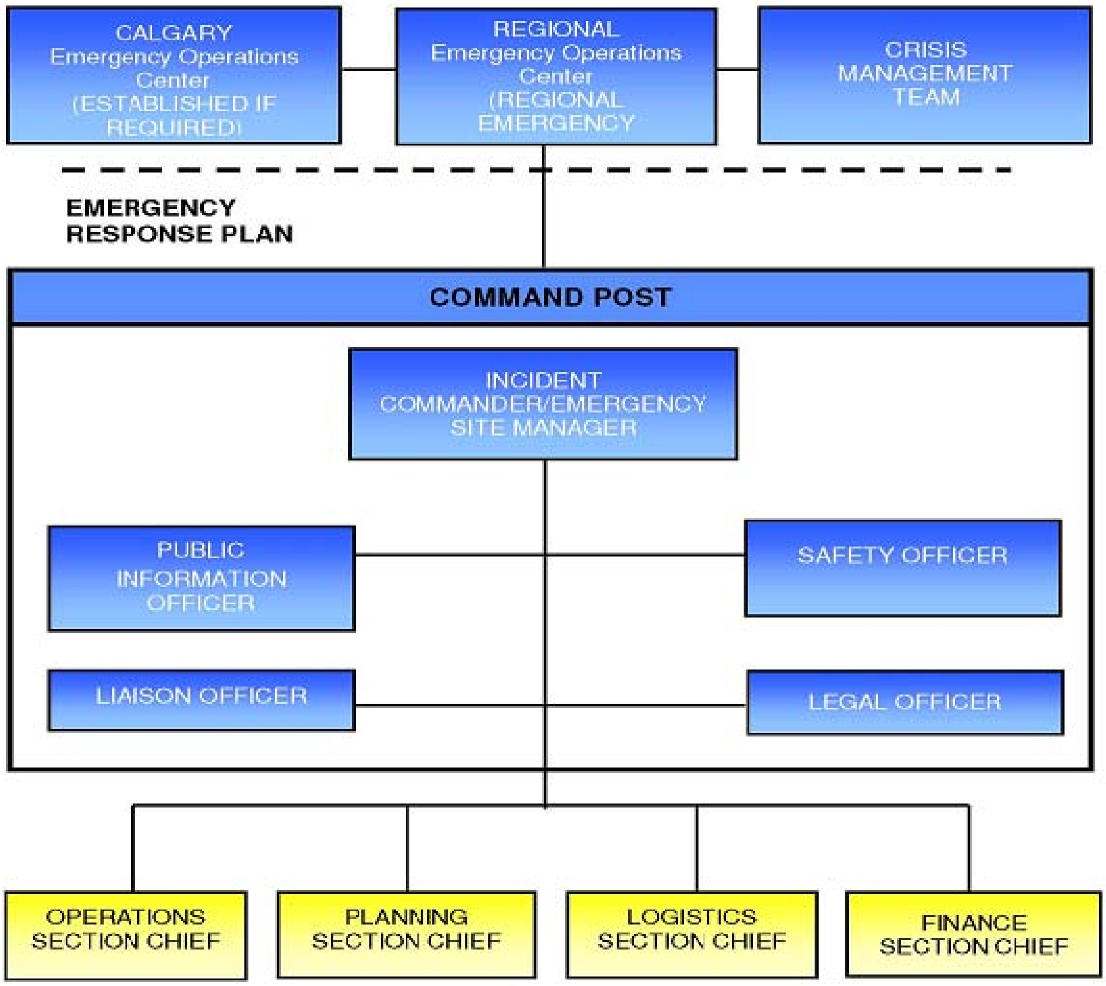
The Unified Command is responsible for overall management of an incident. The Unified Command directs incident activities and approves and releases resources. The Unified Command structure is a vehicle for coordination, cooperation and communication which is essential to an effective response.

Unified Command representatives must be able to:

- Agree on common incident objectives and priorities
- Have the capability to sustain a 24-hour-7-day-per-week commitment to the incident
- Have the authority to commit agency or Company resources to the incident
- Have the authority to spend agency or Company funds
- Agree on an incident response organization
- Agree on the appropriate Command and General Staff assignments
- Commit to speak with "one voice" through the Public Information Officer or Joint Information Center
- Agree on logistical support procedures
- Agree on cost-sharing procedures

FIGURE 3.1
INCIDENT COMMAND SYSTEM

INCIDENT MANAGEMENT SYSTEM



3.7 ICS ROLES AND RESPONSIBILITIES

COMMON RESPONSIBILITIES

The following is a checklist applicable to all personnel in an Incident Commander System organization:

- Receive assignment, including:
  - Job assignment
  - Resource order number and request number
  - Reporting location
  - Reporting time
  - Travel instructions
  - Special communications instructions

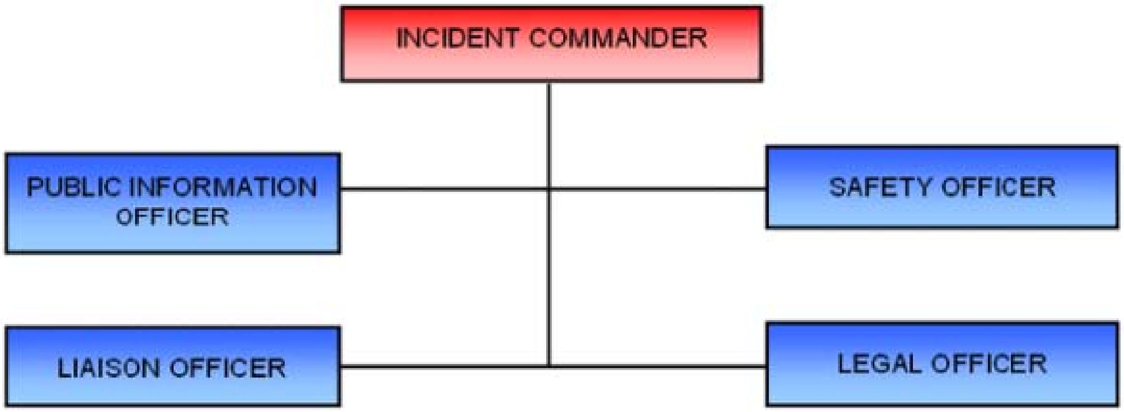
- Upon arrival, check-in at designated check-in location.
- Receive briefing from immediate supervisor.
- Acquire work materials.
- Supervisors maintain accountability for assigned personnel.
- Organize and brief subordinates.
- Know your assigned radio frequency(s) and ensure communications equipment is operating properly.
- Use clear text and Incident Commander System terminology (no codes) in all communications.
  Complete forms and reports required of the assigned position and send to Documentation Unit.
- Maintain unit records, including Unit Log (ICS Form 214).
- Respond to demobilization orders and brief subordinates regarding demobilization.

UNIT LEADER RESPONSIBILITIES

In Incident Commander System, a Unit Leader's responsibilities are common to all units in all parts of the organization. Common responsibilities of Unit Leaders are listed below.

- Review common responsibilities.
- Receive briefing from Incident Commander, Section Chief or Branch Director, as appropriate.
- Participate in incident planning meetings, as required.
- Determine current status of unit activities.
- Order additional unit staff, as appropriate.
- Determine resource needs.
- Confirm dispatch and estimated time of arrival of staff and supplies.
- Assign specific duties to staff; supervise staff.
- Develop and implement accountability, safety and security measures for personnel and resources.
  Supervise demobilization of unit, including storage of supplies.
- Provide Supply Unit Leader with a list of supplies to be replenished.
- Maintain unit records, including Unit Log (ICS Form 214).

COMMAND


INCIDENT COMMANDER
PUBLIC INFORMATION OFFICER
SAFETY OFFICER
LIAISON OFFICER
LEGAL OFFICER

INCIDENT COMMANDER

- Assess the situation and/or obtain a briefing from the prior Incident Commander.
- Determine Incident Objectives and strategy.
- Establish the immediate priorities.
- Establish an Incident Command Post.
- Brief Command Staff and Section Chiefs.
- Review meetings and briefings.
- Establish an appropriate organization.
- Ensure planning meetings are scheduled as required. (Refer to Figure 3.2, The Operational Planning "P" for assistance).
- Approve and authorize the implementation of an Incident Action Plan.
- Ensure that adequate safety measures are in place.
- Coordinate activity for all Command and General Staff.
- Coordinate with key people and officials.
- Approve requests for additional resources or for the release of resources.
- Keep agency administrator informed of incident status.
- Approve the use of trainees, volunteers, and auxiliary personnel.
- Authorize release of information to the news media.
- Ensure incident Status Summary (ICS Form 209-CG) is completed and forwarded to appropriate higher authority.
- Order the demobilization of the incident when appropriate.
- Assign any of the Incident Commander roles and responsibilities to a Deputy Incident Commander as needed.

PUBLIC INFORMATION OFFICER

- Determine from the Incident Commander if there are any limits on information release.
- Develop material for use in media briefings.
- Obtain Incident Commander approval of media releases.
- Inform media and conduct media briefings.
- Arrange for tours and other interviews or briefings that may be required.
- Obtain media information that may be useful to incident planning.
- Maintain current information summaries and/or displays on the incident and provide information on the status of the incident to assigned personnel.

LIAISON OFFICER

- Be a contact point for Agency Representatives.
- Maintain a list of assisting and cooperating agencies and Agency Representatives. Monitor check-in sheets daily to ensure that all Agency Representatives are identified.
- Assist in establishing and coordinating interagency contacts.
- Keep agencies supporting the incident aware of incident status.
- Monitor incident operations to identify current or potential inter-organizational problems.
- Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources.
- Coordinate response resource needs for Natural Resource Damage Assessment and Restoration (NRDAR) activities with the Operations during oil and HAZMAT responses.
- Coordinate response resource needs for incident investigation activities with the Operations.
- Ensure that all required agency forms, reports and documents are completed prior to demobilization.
- Coordinate activities of visiting dignitaries.

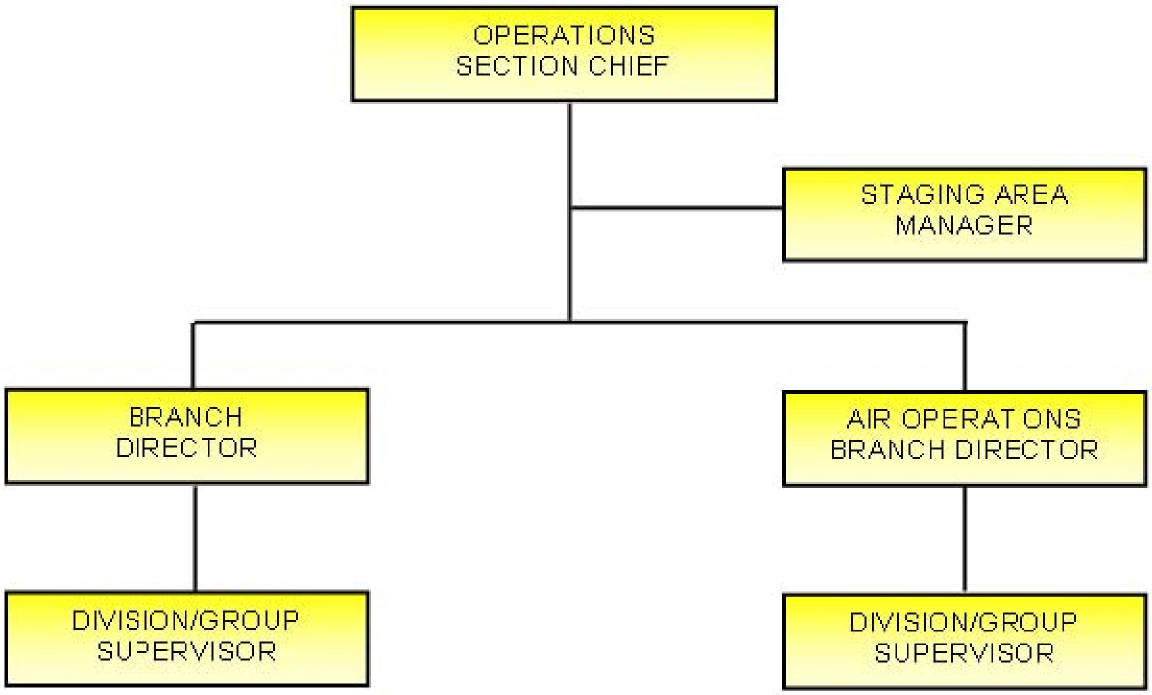
SAFETY OFFICER

- Participate in planning meetings.
- Identify hazardous situations associated with the incident.
- Review the Incident Action Plan for safety implications.
- Exercise emergency authority to stop and prevent unsafe acts.
- Investigate accidents that have occurred within the incident area.
- Review and approve the medical plan.
- Develop the Site Safety Plan and publish Site Safety Plan summary (ICS Form 208) as required.

LEGAL OFFICER

- Participate in planning meetings, if requested.
- Advise on legal issues relating to in-situ burning, use of dispersants, and other alternative response technologies.
- Advise on legal issues relating to differences between Natural Resource Damage Assessment Restoration (NRDAR) and response activities.
- Advise on legal issues relating to investigations.
- Advise on legal issues relating to finance and claims.
- Advise on legal issues relating to response.

OPERATIONS


OPERATIONS
SECTION CHIEF
STAGING AREA
MANAGER
BRANCH
DIRECTOR
AIR OPERATIONS
BRANCH DIRECTOR
DIVISION/GROUP
SUPERVISOR
DIVISION/GROUP
SUPERVISOR

OPERATIONS SECTION GENERAL FUNCTIONS

- Responsible for managing tactical operations at the incident site directed toward reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations.
- Directs and coordinates all incident tactical operations.
- Executes the Incident Action Plan.

OPERATIONS SECTION CHIEF

- Develop operations portion of Incident Action Plan.
- Brief and assign Operations Section personnel in accordance with the Incident Action Plan.
- Supervise Operations Section.
- Determine need and request additional resources.
- Review suggested list of resources to be released and initiate recommendation for release of resources.
- Assemble and disassemble strike teams assigned to the Operations Section.
- Report information about special activities, events, and occurrences to the Incident Commander.
- Respond to resource requests in support of National Resource Damage Assessment and Restoration activities.

BRANCH DIRECTOR

- Develop with subordinates alternatives for Branch control operations.
- Attend planning meetings at the request of the Operations.
- Review Assignment List (ICS Form 204-CG) for Divisions/Groups within the Branch. Modify lists based on effectiveness of current operations.
- Assign specific work tasks to Division/Group Supervisors.
- Supervise Branch operations.
- Resolve logistic problems reported by subordinates.
- Report to Operations when: the Incident Action Plan is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- Approve accident and medical reports originating within the Branch.

DIVISION/GROUP SUPERVISOR

- Implement Incident Action Plan for Division/Group.
- Provide the Incident Action Plan to Strike Team Leaders, when available.
- Identify increments assigned to the Division/Group.
- Review Division/Group assignments and incident activities with subordinates and assign tasks.
- Ensure that the Incident Commander and/or Resources Unit is advised of all changes in the status of resources assigned to the Division/Group.
- Coordinate activities with adjacent Division/Group.
- Determine need for assistance on assigned tasks.
- Submit situation and resources status information to the Branch Director or the Operations.
- Report hazardous situations, special occurrences, or significant events (e.g., accidents, sickness, discovery of unanticipated sensitive resources) to the immediate supervisor.
- Ensure that assigned personnel and equipment get to and from assignments in a timely and orderly manner.
- Resolve logistics problems within the Division/Group.
- Participate in the development of Branch plans for the next operational period.

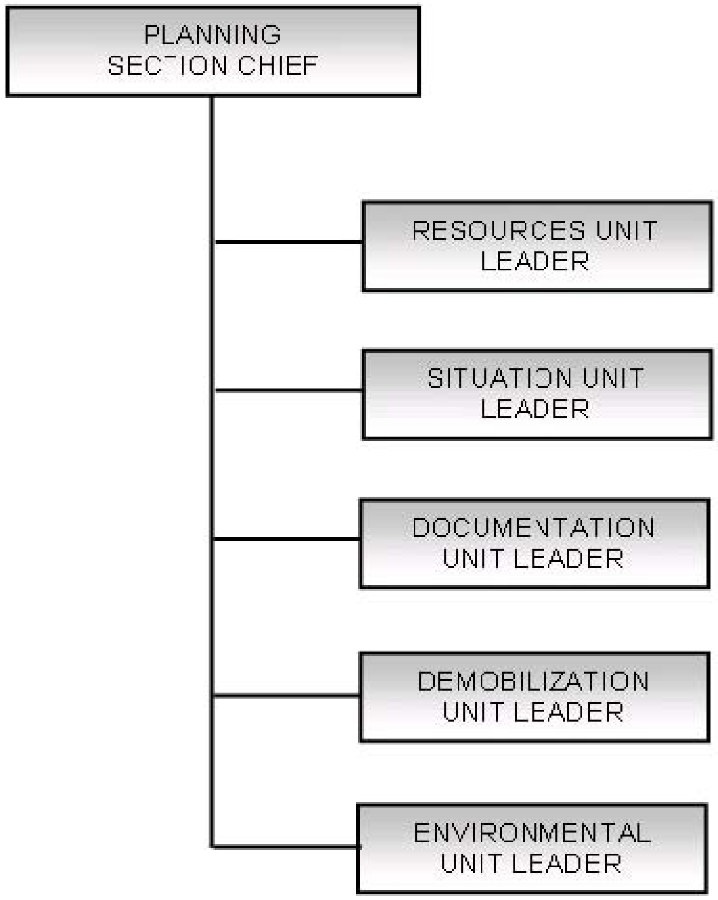
STAGING AREA MANAGER

- Establish Staging Area layout.
- Determine any support needs for equipment, feeding, sanitation and security.
- Establish check-in function as appropriate.
- Post areas for identification and traffic control.
- Request maintenance service for equipment at Staging Area as appropriate.
- Respond to request for resource assignments.
- Obtain and issue receipts for radio equipment and other supplies distributed and received at Staging Area.
- Determine required resource levels from the Operations.
- Advise the Operations when reserve levels reach minimums.
- Maintain and provide status to Resource Unit of all resources in Staging Area.
- Demobilize Staging Area in accordance with the Incident Demobilization Plan.

AIR OPERATIONS BRANCH DIRECTOR

- Organize preliminary air operations.
- Request declaration (or cancellation) of restricted air space
- Participate in preparation of the Incident Action Plan through the Operations. Insure that the air operations portion of the Incident Action Plan takes into consideration the Air Traffic Control requirements of assigned aircraft.
- Perform operational planning for air operations.
- Prepare and provide Air Operations Summary (ICS Form 220) to the Air Support Group and Fixed-Wing Bases.
- Determine coordination procedures for use by air organization with ground Branches, Divisions, or Groups.
- Coordinate with appropriate Operations Section personnel.
- Supervise all air operations activities associated with the incident.
- Evaluate helibase locations.
- Establish procedures for emergency reassignment of aircraft.
- Schedule approved flights of non-incident aircraft in the restricted air space area.
- Coordinate with the Operations Coordination Center (OCC) through normal channels on incident air operations activities.
- Inform the Air Tactical Group Supervisor of the air traffic situation external to the incident.
- Consider requests for non-tactical use of incident aircraft.
- Resolve conflicts concerning non-incident aircraft.
- Coordinate with Federal Aviation Administration.
- Update air operations plans.
- Report to the Operations on air operations activities.
- Report special incidents/accidents.
- Arrange for an accident investigation team when warranted.

PLANNING


PLANNING
SECTION CHIEF
RESOURCES UNIT
LEADER
SITUATION UNIT
LEADER
DOCUMENTATION
UNIT LEADER
DEMOBILIZATION
UNIT LEADER
ENVIRONMENTAL
UNIT LEADER

PLANNING SECTION GENERAL FUNCTIONS

- Responsible for gathering, evaluating, and disseminating tactical information and intelligence critical to the incident.
- Maintaining incident documentation and providing documentation services.
- Preparing and documenting Incident Action Plans.
- Conducting long-range and/or contingency planning.
- Developing alternative strategies.
- Tracking resources assigned to the incident.
- Developing plans for waste disposal.
- Developing plans for demobilization.

PLANNING SECTION CHIEF

- Collect and process situation information about the incident.
- Supervise preparation of the Incident Action Plan.
- Provide input to the Incident Commander and the Operations in preparing the Incident Action Plan.
- Chair planning meetings and participate in other meetings as required. (Refer to Figure 3.2, The Operational Planning “P” for assistance).
- Reassign out-of-service personnel already on-site to Incident Commander System organizational positions as appropriate.
- Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation Units).
- Determine the need for any specialized resources in support of the incident.
- If requested, assemble and disassemble Strike Teams and Task Forces not assigned to Operations.
- Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- Assemble information on alternative strategies.
- Provide periodic predictions on incident potential.
- Report any significant changes in incident status.
- Compile and display incident status information.
- Oversee preparation and implementation of the Incident Demobilization Plan.
- Incorporate plans (e.g., Traffic, Medical, Communications, Site Safety) into the Incident Action Plan.

RESOURCES UNIT LEADER

- Establish the check-in function at incident locations.
- Prepare Organization Assignment List (ICS Form 203-CG) and Incident Organization (ICS Form 207-CG).
- Prepare appropriate parts of Assignment List (ICS Form 204).
- Prepare and maintain the Incident Command Post display (to include organization chart and resource allocation and deployment).
- Maintain and post the current status and location of all resources.
- Maintain master roster of all resources checked in at the incident.

SITUATION UNIT LEADER

- Begin collection and analysis of incident data as soon as possible.
- Prepare, post, or disseminate resource and situation status information as required, including special requests.
- Prepare periodic predictions or as requested by the Planning Section Chief.
- Prepare the Incident Status Summary (ICS Form 209-CG).
- Provide photographic services and maps if required.

DOCUMENTATION UNIT LEADER

- Set up work area; begin organization of incident files.
- Establish duplication service; respond to requests.
- File all official forms and reports.
- Review records for accuracy and completeness; inform appropriate units of errors or omissions.
- Provide incident documentation as requested.
- Store files for post-incident use.

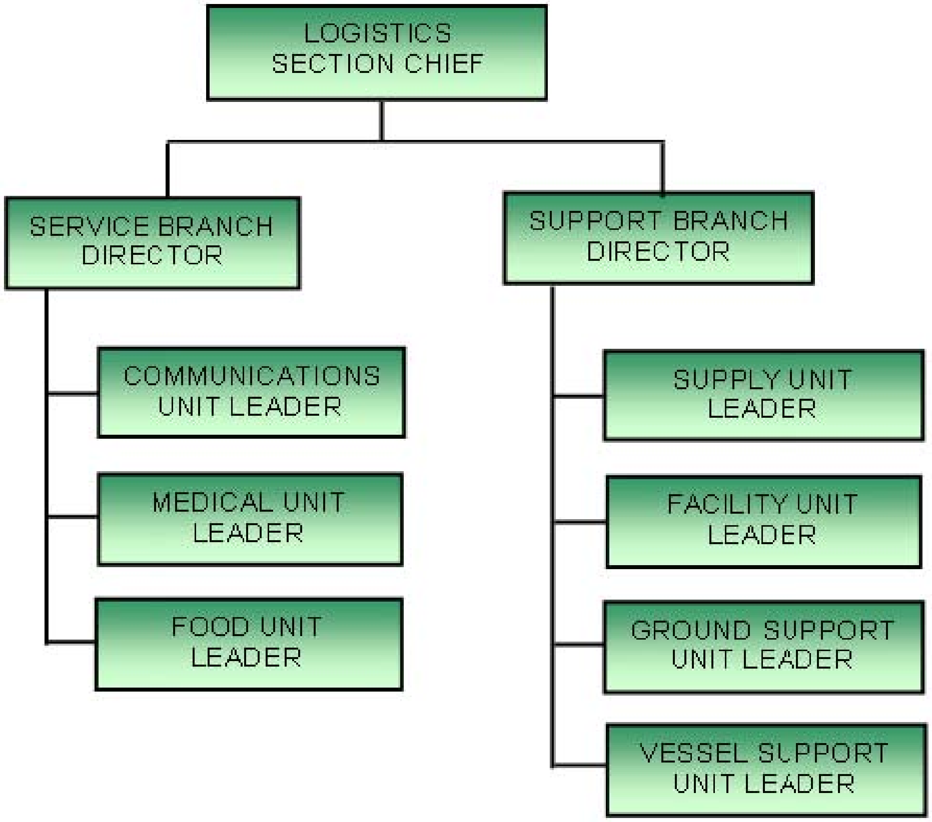
DEMOBILIZATION UNIT LEADER

- Participate in planning meetings as required.
- Review incident resource records to determine the likely size and extent of demobilization effort.
- Based on the above analysis, add additional personnel, workspace, and supplies as needed.
- Coordinate demobilization with Agency Representatives.
- Monitor the on-going Operations Section resource needs.
- Identify surplus resources and probable release time.
- Develop incident check-out function for all units.
- Evaluate logistics and transportation capabilities to support demobilization.
- Establish communications with off-incident facilities, as necessary.
- Develop an Incident Demobilization Plan detailing specific responsibilities and release priorities and procedures.
- Prepare appropriate directories (e.g., maps, instructions, etc.) for inclusion in the demobilization plan.
- Distribute demobilization plan (on and off-site).
- Provide status reports to appropriate requestors.
- Ensure that all Sections/Units understand their specific demobilization responsibilities.
- Supervise execution of the Incident Demobilization Plan.
- Brief the Planning Section Chief on demobilization progress.

ENVIRONMENTAL UNIT LEADER

- Participate in Planning Section meetings.
- Identify sensitive areas and recommend response priorities.
- Following consultation with natural resource trustees, provide input on wildlife protection strategies (e.g., removing oiled carcasses, pre-emptive capture, hazing, and/or capture and treatment).
- Determine the extent, fate and effects of contamination.
- Acquire, distribute and provide analysis of weather forecasts.
- Monitor the environmental consequences of cleanup actions.
- Develop shoreline cleanup and assessment plans. Identify the need for, and prepare any special advisories or orders.
- Identify the need for, and obtain, permits, consultations, and other authorizations including Endangered Species Act (ESA) provisions.
- Following consultation with the Federal On-Scene Commander's Historical/Cultural Resources Technical Specialist identify and develop plans for protection of affected historical/cultural resources.
- Evaluate the opportunities to use various response technologies.
- Develop disposal plans.
- Develop a plan for collecting, transporting, and analyzing samples.

LOGISTICS


LOGISTICS SECTION CHIEF
SERVICE BRANCH DIRECTOR
SUPPORT BRANCH DIRECTOR
COMMUNICATIONS UNIT LEADER
MEDICAL UNIT LEADER
FOOD UNIT LEADER
SUPPLY UNIT LEADER
FACILITY UNIT LEADER
GROUND SUPPORT UNIT LEADER
VESSEL SUPPORT UNIT LEADER

LOGISTICS SECTION GENERAL FUNCTIONS

- Responsible for all support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident locations.
- Ordering, obtaining, maintaining, and accounting for essential personnel, equipment, and supplies.
- Providing communication planning and resources.
- Setting up food services.
- Setting up and maintaining incident facilities.
- Providing support transportation.
- Providing medical services to incident personnel.

LOGISTICS SECTION CHIEF

- Plan the organization of the Logistics Section.
- Assign work locations and preliminary work tasks to Section personnel.
- Notify the Resources Unit of the Logistics Section units activated including names and locations of assigned personnel.
- Assemble and brief Branch Directors and Unit Leaders.
- Participate in preparation of the Incident Action Plan.
- Identify service and support requirements for planned and expected operations.
- Provide input to and review the Communications Plan, Medical Plan and Traffic Plan.
- Coordinate and process requests for additional resources.
- Review the Incident Action Plan and estimate Section needs for the next operational period.
- Advise on current service and support capabilities.
- Prepare service and support elements of the Incident Action Plan.
- Estimate future service and support requirements.
- Receive Incident Demobilization Plan from Planning Section.
- Recommend release of Unit resources in conformity with Incident Demobilization Plan.
- Ensure the general welfare and safety of Logistics Section personnel.

SERVICE BRANCH DIRECTOR

- Determine the level of service required to support operations.
- Confirm dispatch of Branch personnel.
- Participate in planning meetings of Logistics Section personnel.
- Review the Incident Action Plan.
- Organize and prepare assignments for Service Branch personnel.
- Coordinate activities of Branch Units.
- Inform the Logistic Section Chief of Branch activities.
- Resolve Service Branch problems.

COMMUNICATIONS UNIT LEADER

- Prepare and implement the Incident Radio Communications Plan (ICS Form 205-CG).
- Ensure the Incident Communications Center and the Message Center is established.
- Establish appropriate communications distribution/maintenance locations within the Base/Camp(s).
- Ensure communications systems are installed and tested.
- Ensure an equipment accountability system is established.
- Ensure personal portable radio equipment from cache is distributed per Incident Radio Communications Plan.
- Provide technical information as required on:

    - Adequacy of communications systems currently in operation.
    - Geographic limitation on communications systems.
    - Equipment capabilities/limitations.
    - Amount and types of equipment available.
    - Anticipated problems in the use of communications equipment.

- Supervise Communications Unit activities.
- Maintain records on all communications equipment as appropriate.
- Ensure equipment is tested and repaired.
- Recover equipment from Units being demobilized.

MEDICAL UNIT LEADER

- Participate in Logistics Section/Service Branch planning activities.
- Prepare the Medical Plan (ICS Form 206-CG).
- Prepare procedures for major medical emergency.
- Declare major emergency as appropriate.
- Respond to requests for medical aid, medical transportation, and medical supplies.
- Prepare and submit necessary documentation.

FOOD UNIT LEADER

- Determine food and water requirements.
- Determine the method of feeding to best fit each facility or situation.
- Obtain necessary equipment and supplies and establish cooking facilities.
- Ensure that well-balanced menus are provided.
- Order sufficient food and potable water from the Supply Unit.
- Maintain an inventory of food and water.
- Maintain food service areas, ensuring that all appropriate health and safety measures are being followed.
- Supervise caterers, cooks, and other Food Unit personnel as appropriate.

SUPPORT BRANCH DIRECTOR

- Determine initial support operations in coordination with the Logistic Section Chief and Service Branch Director.
- Prepare initial organization and assignments for support operations.
- Assemble and brief Support Branch personnel.
- Determine if assigned Branch resources are sufficient.
- Maintain surveillance of assigned units work progress and inform the Logistic Section Chief of their activities.
- Resolve problems associated with requests from the Operations Section.

SUPPLY UNIT LEADER

- Participate in Logistics Section/Support Branch planning activities.
- Determine the type and amount of supplies en route.
- Review the Incident Action Plan for information on operations of the Supply Unit.
- Develop and implement safety and security requirements.
- Order, receive, distribute, and store supplies and equipment.
- Receive and respond to requests for personnel, supplies, and equipment.
- Maintain an inventory of supplies and equipment.
- Service reusable equipment.
- Submit reports to the Support Branch Director.

FACILITY UNIT LEADER

- Review the Incident Action Plan.
- Participate in Logistics Section/Support Branch planning activities.
- Determine requirements for each facility, including the Incident Command Post.
- Prepare layouts of incident facilities.
- Notify Unit Leaders of facility layout.
- Activate incident facilities.
- Provide Base and Camp Managers and personnel to operate facilities.
- Provide sleeping facilities.
- Provide security services.
- Provide facility maintenance services (e.g., sanitation, lighting, clean up).
- Demobilize Base and Camp facilities.
- Maintain facility records.

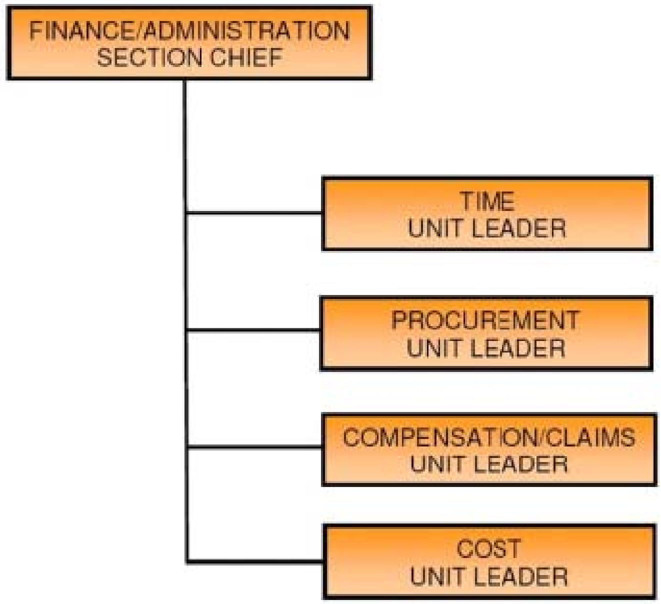
GROUND SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Develop and implement the Traffic Plan.
- Support out-of-service resources.
- Notify the Resources Unit of all status changes on support and transportation vehicles.
- Arrange for and activate fueling, maintenance, and repair of ground resources.
- Maintain Support Vehicle Inventory and transportation vehicles (ICS Form 218).
- Provide transportation services, In accordance with requests from the Logistic Section Chief or Support Branch Director.
- Collect information on rented equipment.
- Requisition maintenance and repair supplies (e.g., fuel, spare parts).
- Maintain incident roads.
- Submit reports to Support Branch Director as directed.

VESSEL SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Coordinate development of the Vessel Routing Plan.
- Coordinate vessel transportation assignments with the Protection and Recovery Branch or other sources of vessel transportation.
- Coordinate water-to-land transportation with the Ground Support Unit, as necessary.
- Maintain a prioritized list of transportation requirements that need to be scheduled with the transportation source.
- Support out-of-service vessel resources, as requested.
- Arrange for fueling, dockage, maintenance and repair of vessel resources, as requested.
- Maintain inventory of support and transportation vessels.

FINANCE/ADMINISTRATION



FINANCE/ADMINISTRATION SECTION GENERAL FUNCTIONS

- Responsible for all financial and cost analysis aspects of an incident. (Note: Not all incidents will require a separate Finance/Administration Section. In cases that require only one specific function (e.g., cost analysis), this service may be provided by a member of the Planning Section.)
- Administering any contract negotiation.
- Providing cost analysis as it pertains to the Incident Action Plan.
- Maintaining cost associated with the incident.
- Tracking personnel and equipment time.
- Addressing compensation for injury or damage to property issues.

FINANCE/ADMINISTRATION SECTION CHIEF

- Attend planning meetings as required.
- Manage all financial aspects of an incident.
- Provide financial and cost analysis information as requested.
- Gather pertinent information from briefings with responsible agencies.
- Develop an operating plan for the Finance/Administration Section; fill supply and support needs.
- Determine the need to set up and operate an incident commissary.
- Meet with assisting and cooperating agency representatives, as needed.
- Maintain daily contact with agency(s) administrative headquarters on Finance/ Administration matters.
- Ensure that all personnel time records are accurately completed and transmitted, according to policy.
- Provide financial input to demobilization planning.
- Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- Brief administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.

TIME UNIT LEADER

- Determine incident requirements for time recording function.
- Determine resource needs.
- Contact appropriate agency personnel/representatives.
- Ensure that daily personnel time recording documents are prepared and in compliance with policy.
- Establish time unit objectives.
- Maintain separate logs for overtime hours.
- Establish commissary operation on larger or long-term incidents as needed.
- Submit cost estimate data forms to the Cost Unit, as required.
- Maintain records security.
- Ensure that all records are current and complete prior to demobilization.
- Release time reports from assisting agency personnel to the respective Agency Representatives prior to demobilization.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

PROCUREMENT UNIT LEADER

- Review incident needs and any special procedures with Unit Leaders, as needed.
- Coordinate with local jurisdiction on plans and supply sources.
- Obtain the Incident Procurement Plan.
- Prepare and authorize contracts and land-use agreements.
- Draft memoranda of understanding as necessary.
- Establish contracts and agreements with supply vendors.
- Provide for coordination between the Ordering Manager, agency dispatch, and all other procurement organizations supporting the incident.
- Ensure that a system is in place that meets agency property management requirements. Ensure proper accounting for all new property.
- Interpret contracts and agreements; resolve disputes within delegated authority.
- Coordinate with the Compensation/Claims Unit for processing claims.
- Coordinate use of impress funds, as required.
- Complete final processing of contracts and send documents for payment.
- Coordinate cost data in contracts with the Cost Unit Leader.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

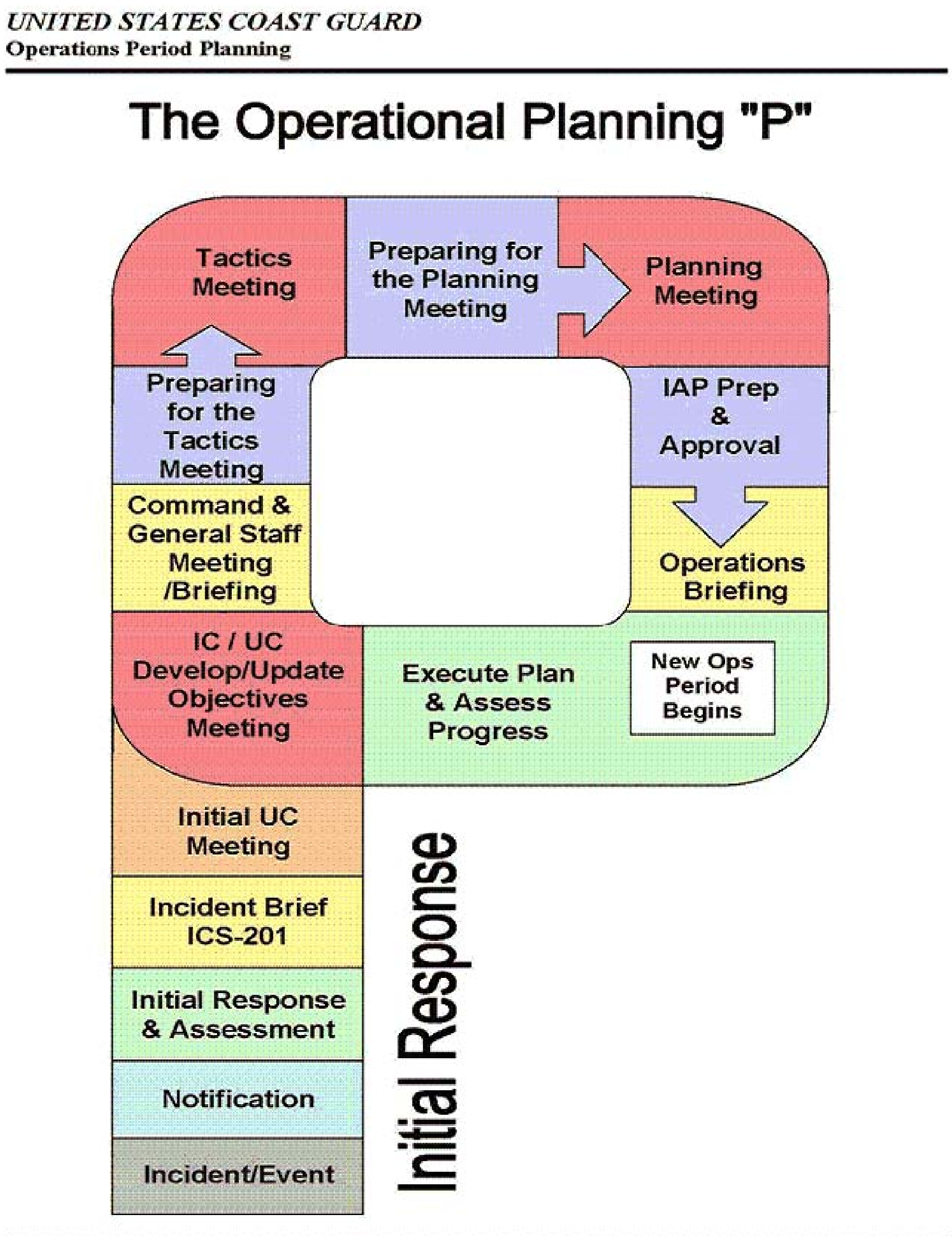
COMPENSATION/CLAIMS UNIT LEADER

- Establish contact with the incident Security Officer and Liaison Officer (or Agency Representatives if no Liaison Officer is assigned).
- Determine the need for Compensation for Injury and Claims Specialists and order personnel as needed.
- Establish a Compensation for Injury work area within or as close as possible to the Medical Unit.
- Review Medical Plan (ICS Form 206-CG).
- Ensure that Compensation/Claims Specialists have adequate workspace and supplies.
- Review and coordinate procedures for handling claims with the Procurement Unit.
- Brief the Compensation/Claims Specialists on incident activity.
- Periodically review logs and forms produced by the Compensation/Claims Specialists to ensure that they are complete, entries are timely and accurate and that they are in compliance with agency requirements and policies.
- Ensure that all Compensation for Injury and Claims logs and forms are complete and routed appropriately for post-incident processing prior to demobilization.
- Keep the Finance/Administration Section Chief briefed on Unit status and activity.
- Demobilize unit in accordance with the Incident Demobilization Plan.

COST UNIT LEADER

- Coordinate cost reporting procedures.
- Collect and record all cost data.
- Develop incident cost summaries.
- Prepare resources-use cost estimates for the Planning Section.
- Make cost-saving recommendations to the Finance/Administration Section Chief.
- Ensure all cost documents are accurately prepared.
- Maintain cumulative incident cost records.
- Complete all records prior to demobilization.
- Provide reports to the Finance/Administration Section Chief.

FIGURE 3.2


UNITED STATES COAST GUARD
Operations Period Planning
The Operational Planning "P"
Tactics Meeting
Preparing for the Planning Meeting
Planning Meeting
Preparing for the Tactics Meeting
IAP Prep & Approval
Command & General Staff Meeting /Briefing
Operations Briefing
IC / UC Develop/Update Objectives Meeting
Execute Plan & Assess Progress
New Ops Period Begins
Initial UC Meeting
Incident Brief ICS-201
Initial Response & Assessment
Notification
Incident/Event
Initial Response

SECTION 4

SPILL IMPACT CONSIDERATIONS

4.1 CRITICAL AREAS TO PROTECT

The critical areas to protect are classified as high, moderate, and low sensitivity to oil for non-coastal/inland environments. The Federal, Province/State, and Local authorities will further clarify these categories at the time of the response. The categories are defined as follows:

HIGH SENSITIVITY
• Areas which are high in productivity, abundant in many species, extremely sensitive, difficult to rehabilitate, or inhabited by threatened/endangered species. • Areas which consist of forested areas, brush/grassy areas, wooded lake areas, freshwater marshes, wildlife sanctuaries/refuges, and vegetated river/stream banks.
MODERATE SENSITIVITY
• Areas of moderate productivity, somewhat resistant to the effects of oiling. • Areas which consist of degraded marsh habitat, clay/silt banks with vegetated margins, and gravel/cobble beaches.
LOW SENSITIVITY
• Areas of low productivity, man-made structures, and/or high energy. • Areas which consist of gravel, sand, or clay material, barren/rocky riverbanks and lake edges, man-made structures, and concrete/compacted earthen drainage ditches.

4.2 ENVIRONMENTAL/SOCIO-ECONOMIC SENSITIVITIES

Environmental/Socio-economic sensitivities are of extreme importance when planning a response effort. The health and safety of the public and the environment, as well as the protection of the various socio-economic sensitivities, must be promptly addressed in order to mitigate the extent of damage and minimize the cost of the clean-up effort.

It is important to protect archeological sites and heritage resources (e.g. National Parks, National Marine Conservation Areas, and National Historic Sites). Impacted archeological sites or heritage resources of an area need to be identified and the likely impacts that result from the activities should be addressed. Specific consideration should be given to access to, and general use and disturbance of areas. The assessment should consider both direct and indirect impacts, cultural protocols and strategies for minimizing impacts. Consultation with local indigenous communities should occur as part of the planning process.

The Company will explore, where appropriate, equivalent environmental protection systems, methods, devices, or technologies that maintain or may be less damaging to the character of heritage resources or archeological sites. If a release from the pipeline impacts a heritage resource, the Company will respond as outlined in Section 3.0, report to the appropriate authority prescribed by law, cleanup and restore the area as required by regulation, and conduct such sampling, analyses, or associated monitoring during and after restoration.

All environmental/socio-economic sensitivities are worthy of protection, but must be prioritized during a response effort. When making decisions on which areas to designate as collection areas and which to protect, the following sources may be consulted:

- Canadian Wildlife Services, U.S. Fish and Wildlife Service and related province/ state agencies
- Applicable Area Contingency Plans
- Other industry and private experts

The environmental and socio-economic sensitivities in the vicinity of the Pipeline have been broken down into specific categories and identified in this Section. To further clarify the location of the sensitive areas of concern, references to published Area Contingency Plans and Environmental Sensitivity Maps are also provided in this section.

4.3 FISHERIES AND WILDLIFE PROTECTION

The Company will work with Federal, Province/State, and local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill, as necessary. Oversight of the Company's wildlife preservation activities and coordination with Federal, Province/State, and Local agencies during an oil spill is the responsibility of the Incident Commander.

Protecting fish habitat (e.g. spawning and rearing grounds) is important to both consumers and commercial fisheries. Beyond typical response strategies, other options could include moving floating facilities, temporarily sinking facilities using cages designed for this purpose, temporary suspension of water intakes, or closing sluice gates to isolate the facilities from contamination.

Special consideration should be given to the protection and rehabilitation of endangered species and other wildlife and their habitat in the event of an oil spill and subsequent response. Jurisdictional authorities should be notified and worked with closely on all response/clean-up actions related to wildlife protection and rehabilitation. Laws with significant penalties are in place to ensure appropriate protection of these species.

Wildlife Rescue

The Company will work with Federal, Province/State, and Local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate wildlife affected by an oil spill, as the situation demands.

The following are items which should be considered for wildlife rescue and rehabilitation during a spill response:

Bird relocation can be accomplished using a variety of deterrents, encouraging birds to avoid areas of spilled oil. Bird relocation can be accomplished by utilizing deterrent methods including:

- Use of visual stimuli, such as inflatable bodies, owls, stationary figures, or helium balloons, etc.
- Use of auditory stimuli, such as propane cannons, recorded sounds, or shell crackers.
- Use of herding with aircraft, boats, vehicles, or people (as appropriate).Use of capture and relocation.

Search and Rescue -Points to consider

- **The Company's involvement should be limited to offering assistance as needed or requested by the agencies.**
- Prior to initiating any organized search and rescue plan, authorization must be obtained from the appropriate Federal/State agency.
- Initial search and rescue efforts, if needed, should be left up to the appropriate agencies.
- They have the personnel, equipment, and training to immediately begin capturing contaminated wildlife.
- With or without authorization, it must be anticipated that volunteer citizens will aid distressed/contaminated wildlife on their own. It is important to communicate that it may be illegal to handle wildlife without express authority from appropriate agencies. Provisions should be made to support an appropriate rehabilitator; however, **no support should be given to any unauthorized volunteer rescue efforts.**
- The regulatory agencies and response personnel should be provided the name and location of a qualified rehabilitator in the event contaminated wildlife is captured.

4.4 STAGING AREAS

When establishing personnel and equipment staging areas for a response to a Pipeline discharge, the following criteria should be evaluated:

- Access to waterborne equipment launching facilities and/or land equipment.
- Access to open space for staging/deployment of heavy equipment and personnel.
- Access to public services utilities (electricity, potable water, public phone, restroom and washroom facilities, etc.).
- Access to the environmental and socio-economically sensitive areas which are projected for impact.

4.5 CONTAINMENT AND RECOVERY OF SPILLED PRODUCT

General descriptions of various specific response techniques that may be applied during a response effort are discussed below. Company responders are free to use all or any combination of these methods as incident conditions require, provided they meet the appropriate safety standards and other requirements relative to the situation encountered. Data was obtained from reports, manuals and pamphlets prepared by the American Petroleum Institute, Environmental Protection Agency, and the United States Coast Guard. The most effective cleanup of a product spill will result from an integrated combination of clean-up methods. Each operation should complement and assist related operations and not merely transfer spillage problems to areas where they could be more difficult to handle.

The spill should be assessed as soon as possible to determine the source, extent and location of travel. Terrain and other physical conditions downgradient of the spill site will determine the methods of control at a point in advance of the moving product. Often, the bulk of a spill can be contained at a single location or a few key locations in the immediate vicinity of the source point. When possible, the execution of this type of initial containment strategy helps confine a spill to a relatively limited area.

Spill on Land (Soil Surfaces)

Containment Methods

Product can be trapped in ditches and gullies by earth dams. Where excavating machinery is available, dams can be bulldozed to contain lakes of product. Dams, small and large, should be effectively employed to protect priority areas such as inlets to drains, sewers, ducts and watercourses. These can be constructed of earth, sandbags, absorbents, planks or any other effective method. If time does not permit a large dam, many small ones can be made, each one holding a portion of the spill as it advances. The terrain will dictate the placement of the dams. If the spill is minor, natural dams or earth absorption will usually stop the product before it advances a significant distance. Cleanup is the main concern in such situations.

In situations where vapors from a spill present a clear and present danger to property or life (possible ignition because of passing automobiles, nearby houses, or work vehicles approaching the area), spraying the surface of the spill with dispersant will greatly reduce the release of additional vapors from the product. This method is especially adapted to gasoline spills on soil surfaces.

Removal Methods

The recovery and removal of free product from soil surfaces is a difficult job. The best approaches at present seem to be:

- Removal with suction equipment to tank truck if concentrated in volumes large enough to be picked up. Channels can be formed to drain pools of product into storage pits. The suction equipment can then be used.

- Small pockets may have to be dipped up by hand.

- If practicable after removal of the bulk of the spill, controlled burning presents the possibility of a fast, simple, and inexpensive method of destruction of the remainder of the product. If all other options have been executed and the site is still unsafe for further activity because explosive vapors persist, the vapors may need to be intentionally ignited to prevent an accumulation sufficient to become an explosive mixture, provided the other requirements of these guidelines for controlled burning are met.

Intentional ignition to remove released product should be utilized only if all of the following conditions are met:

- Other steps and procedures have been executed and a determination has been made that this is the safest remaining method of control.

- Intentional burning will not unduly damage pipelines, adjacent property, or the environment.

- Controlled burning is permitted by government authorities. Local government authorities to be contacted may include city council, county board of commissioners, city or county fire chiefs, the county forestry commission or fire tower, and the local environmental protection agency. In seeking permission from these authorities, be prepared to convince them that adequate safety precautions have been and will be taken during the operation.

- Controlled burning is conducted with the consent of local land owners.

- Safety must always be a prime consideration when considering controlled burning of product. Sparks and heat radiation from large fires can start secondary fires and strong winds make fire control difficult. There must be no danger of the fire spreading beyond control limits. All persons must be at a safe distance from the edge of the inflammable area. Remember that all burning must be controlled burning.

Spill on Lake or Pond (Calm or Slow-Moving Water)

Containment Methods

A lake or pond offers the best conditions for removal of product from water. Although the removal is no easy task, the lake or pond presents the favorable conditions of low or no current and low or no waves.

The movement of product on a lake or pond is influenced mainly by wind. The product will tend to concentrate on one shore, bank or inlet. Booms should be set up immediately to hold the product in the confined area in the event of a change in wind direction.

If the spill does not concentrate itself on or near a shore (no wind effect), then a sweeping action using boats and floating booms will be necessary.

The essential requirement for this operation is that it be done very slowly. The booms should be moved at not more than 40 feet per minute. Once the slick is moved to a more convenient location (near shore), the normal operations of removal should begin.

If the slick is small and thin (rainbow effect) and not near the shoreline, an absorbent boom instead of a regular boom should be used to sweep the area very slowly and absorb the slick. The product may not have to be moved to the shoreline. See Figure 4.1 for on-water recovery decision tree.

Removal Methods

If the Containment slick is thick enough, regular suction equipment may be used first; however, in most instances, a floating skimmer should be used.

If the floating skimmer starts picking up excess water (slick becomes thin), drawing the boom closer to the bank as product is removed will also keep film of product thicker.

However, when the slick becomes too thin, the skimmer should be stopped and an absorbent applied (with a boat if necessary) to remove the final amounts. The floating skimmer (if speed is a must) or hand skimmers (if water is shallow enough) or both can be used to pick up the product-soaked absorbent. Before pumping the product-soaked absorbent with a floating skimmer, ensure that the absorbent in question can be pumped and will not harm the pump. Several types are nonabrasive to pump internals. If the floating skimmer is used first, the product-soaked absorbent/water mixture should be pumped into a tank truck.

A better method of retrieving the product-soaked absorbent is to draw it in as close to the shore as possible with the booms used to confine the product initially. The absorbent can then be hand skimmed from the water surface and placed in drums, on plastic sheets or in lined roll-off boxes. It should then be disposed of by acceptable means.

The final rainbow on the surface can be removed with additions of more absorbent.

Spill on Small to Medium Size Streams (Fast-Flowing Creeks)

Containment Methods

The techniques used for product containment on fast-flowing shallow streams are quite different from the ones used on lakes, ponds, or other still bodies of water. The containment and removal processes require a calm stretch of water to allow the product to separate onto the surface of the water. If a calm stretch of water does not exist naturally, a deep slow-moving area should be created by damming. The dam can be constructed by using sandbags, planks or earth. If a dam is required, it should be situated at an accessible point where the stream has high enough banks. The dam should be constructed soundly and reinforced to support the product and water pressure.

- Underflow dam -The underflow dam is one method that can be used, especially on small creeks. The water is released at the bottom, of the dam using a pipe or pipes which are laid during construction of the dam. The flow rate through the pipe must be sufficient to keep the dam from overflowing. One method is to lay the pipe at an angle through the dam (while dam is being constructed) so that the height of the downstream end of the pipe will determine the height the water will rise behind the dam.

- Overflow dam -Another method of containment is the overflow type dam. The dam is constructed so that water flows over the dam, but a deep pool is created which slows the surface velocity of the water. Therefore, the condition of a calm stretch of water is met. The overflow dam may be used where larger flow rates (medium size creeks) of water are involved

  With this type dam, a separate barrier (floating or stationary boom) must be placed across the pool created by the dam. The separate barrier arrests the surface layer of product. At the same time, the water is flowing under the barrier and over the top of the dam. The barrier should be placed at an angle of 45 % across the pool to decrease the effective water velocity beneath it. Also, it helps to concentrate the product at the bank and not all along the barrier. A second barrier should be placed approximately 10 to 15 feet downstream of the first one as a secondary back-up.

  The stationary boom type barrier should be made of wood planks or other suitable material. The stationary boom should be soundly constructed and sealed against the bank. The ends of the planks can be buried in the banks of the stream and timber stakes driven into the stream bed for support as needed. The necessary length of the boom will be approximately 1-1/2 times the width of the waterway.

The plank boom should extend six to eight inches deep into the water and about two inches or higher above the water level. If the increase in velocity under the stationary boom is causing release of trapped product, it should be moved upward slightly. At no time should barrier be immersed more than 20% of the depth of the pool at the barrier location; that is, if the pool created by damming is three feet deep, do not exceed an immersion depth of seven inches with the barrier at the position the barrier is installed.

Another method used with the underflow dam is having the pipe or pipes sized to carry only a portion of the flow needed. The pipe would be placed at the bottom of the dam and level with the creek bed. The remaining flow of the creek could be siphoned or preferably pumped around the dam from a point away from the dam and from the deepest portion of the pool. The pumping or siphoning can be controlled to maintain the desired water level at the dam. The key is the removal of water through or around the dam at the lowest point in the basin. This prevents the oil from escaping with the released water.

A floating boom can be used in place of the stationary type if the created pool's size (bank to bank) and depth will permit. Since changing the depth and/or length of a standard floating boom in a small stream is difficult, the use of the separation of product and water. The advantages of using a floating boom are the speed of deployment and the fact that there is no need for additional support as with the stationary boom.

- Multiple Impoundments -Since emergency built dams (either underflow or overflow) are seldom perfect, a series of dams is usually required. The first one or two will trap the bulk and the ones that are downstream will trap the last traces of product. Precautions should be taken to ensure that the foundations of emergency dams are not washed away by the released water. If earth is used to construct an overflow dam, a layer of earth-filled bags should be placed on top of the dam so erosion will not take place. See Figure 4.1 for on-water recovery decision tree.

Removal Methods

Once the containment dams are constructed, the problem or removal of the product from the water surface should be the prime consideration. The removal must be continuous or else build-up of product behind the dams or booms might lead to product escaping the traps.

The type of removal procedures used depends largely on the amount of product being trapped in a given span of time, if the amount of product moving down the stream is of sufficient quantity, the first dam or fixed boom would quite possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and possibly some water to a tank truck or other holding tank. Separated water may be released from the bottom of the tank truck if it becomes necessary. The absorbents could then be used at downstream dams or booms. It is inadvisable to place an absorbent in the stream prior to or at the first dam in anticipation of the arriving product. Let the product accumulate at the first dam and use the floating skimmer to recover the product.

Disposal of gross amount of product-soaked absorbent would not then be a problem. Follow directions on use of each absorbent. Some are designed to be placed on water before product arrives; others are intended only to be placed on the product after it accumulates on the water. Plastic sheets should be used to place the product-soaked absorbent on as it is hand skimmed from the water. Alternatively, the material may be placed in drums or lined roll-off boxes.

The containment and removal of spilled product on small to medium fast-flowing streams might require a combination of underflow or overflow dams, fixed booms, skimmers, and absorbents, to ensure a complete cleanup.

Spill on Large Streams and Rivers

Containment Methods

The containment techniques differ considerably on large streams and rivers versus small streams. First, the smooth calm area of water necessary for product-water separation must be found along the stream or river rather than making one as with small streams. Floating booms (rather than fixed booms or dams) must be used to trap the surfaced product.

Local conditions of current and wind must be considered when selecting the site for the boom. A point with a low water velocity near the bank, sufficient depth to operate the product removal equipment, and good access are required. The fact that wind may tend to concentrate the product against one bank must be considered. A smooth, undisturbed area of water is required immediately upstream of the boom to ensure that the product has opportunity to separate out onto the surface. The boom should be positioned where the current is at a minimum. It is more effective to boom at a wide, slow position than on a narrow, fast stretch of water.

If the boom are positioned straight across a river or stream, at right angles to the flow, surface water tends to dive beneath the barrier (boom) when current velocities exceed about ½ knot (0.8 ft./sec.). However, if the current of the entire river is ½ knot or less, then a boom can be positioned straight across the river or large stream, but angled slightly in relation of the banks. By placing the boom at an angle to the banks, product on the surface is diverted along the boom to the side of the river.

The current velocity is usually much slower near the river bank than in the center and the product will move along the boom toward the bank for removal. A water-tight seal between the bank and the boom is essential. A secondary boom should be set up immediately downstream of the first one to capture the amounts that escape the upstream boom. A boom can be employed parallel to the river flow at the bank to form the seal with the booms used to trap the product.

Where the current velocity of the chosen site exceeds ½ knot, the boom should be positioned in two smooth curves from a point of maximum velocity (usually the center of the river) to both banks. However, this double-boom required product to be removed from both sides of the river. To determine the appropriate angle of boom placement and support (mooring) needed to hold the booms in position, the current velocity should be measured by timing a floating object which is 80% submerged over a distance of 100 feet. A time of 60 seconds over this distance indicates a water current of approximately 1 knot.

For currents from 1 to 2.5 knots (1.7 to 4.2 ft./sec.), the more the boom will have to be angled acute to the bank. The length of the boom will have to be such to reach the center of the river. For currents between ½ and 1 knot (0.8 and 1.7 ft./sec.), the angle of employment can be enlarged.

The major load on the boom is taken by the terminal moorings, particularly the one in the center of the river. However, intermediate moorings are also required both to maintain the smooth curve of the boom to prevent breaking of the boom and to assist with preventing skirt deflection. The intermediate moorings are preferably positioned every 25 feet and must be adjusted to avoid the formation of indentations in the boom profile. These trap product in pockets, prevent its deflection to the bank, and also encourage diving currents. The mooring ropes should be five times the water depth.

In certain situations, it might be advantageous to position booms to deflect the approaching spilled product to a slower moving area. Naturally, additional booms would have to be positioned around this slower moving area prior to deflecting the product to the area. This approach has been used along river which has lagoons, etc., with a very low current action. The recovery would take place in the lagoons and not along the river bank. See Figure 4.1 for on-water recovery decision tree.

Removal Methods

The product collected upstream of the floating booms in a large stream or river should be removed from the water surface as it accumulates. Regular suction equipment, a floating skimmer, and/or absorbents (including absorbent booms) should be used to remove the product as appropriate to the quantity being trapped in a given span of time. If the amount moving down the stream is of sufficient quantity, the primary floating boom would possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and some water to a tank truck or other holding tank.

The absorbents would then be used upstream of the secondary boom to absorb the underflow from the primary boom. An absorbent boom can also be placed between the primary and secondary booms to help the other absorbents control the underflow from the primary boom.

It is best to hand skim the saturated absorbents and place on plastic sheets. However, if the absorbent used can be pumped after product absorption and speed of removal is a necessity, the floating skimmer can be used to remove the product-soaked absorbent.

The disadvantage of pumping the product-soaked absorbent to a truck is the volume that will accumulate (skimmer will pump excess water) and the disposal problems associated with the large water/product-soaked absorbent mixture.

Spill on Stream which Flows into Lake or Pond

In certain locations where streams (small and large ones) flow into lakes or ponds at relatively short distances, it is conceivable that a spill could reach the lake before containment and recovery operations are set up. If time permits for containment operations to be set up on the stream in question, it then would be handled as described above depending upon the stream size involved.

However, if product in the stream is near the lake site or if product is flowing into the lake with a significant amount yet to arrive, a different containment should be employed.

Containment Methods

Product on a stream flowing into a lake should be boomed as close to the entrance as possible. The boom should be positioned on the lake at an angle to the residential stream current so as to direct the surface water to a slower moving area. The area where the product is being deflected should be enclosed by booms to contain it. An additional boom for sweeping the product to the bank will be required. This area of containment should not have a current velocity of more than 1/2 knot (0.8 ft./sec.), preferably less. See Figure 4.1 for on-water recovery decision tree.

Removal Methods

The removal of product from the lake or pond's surface would be handled as described earlier.

For sizable releases, collected product will usually be pumped into tank trucks and transported to a storage facility. Tank trucks are available at several locations throughout.

Spill in Urban Areas

Oil spills in urban areas can greatly impact recreational use, human health, wildlife habitat(s), and potential beach or park closures. Manmade structures along waterways require unique protection strategies. Manmade structures could include vertical shore protection structures such as seawalls, piers, and bulkheads, as well as riprap revetments and groins, breakwaters, and jetties. Vertical structures can be constructed of concrete, wood, and corrugated metal. They usually extend below the water surface, although seawalls can have beaches or riprap in front of them. These structures are very common along developed shores, particularly in harbors, marinas, and residential areas. The range in degree of exposure to waves and currents varies widely, from very low in dead-end canals, to very high on offshore breakwaters. Boat wakes can generate wave energy in otherwise sheltered areas. Maintaining shipping or other kinds of vessel traffic through navigation channels or waterways during a spill response is a difficult consideration because there is usually economic and political pressure to re-establish normal operations as soon as possible. This consideration extends to vehicular traffic through urban areas. Deploying booms and skimmers or constructing recovery sites can conflict with such traffic for several days. Also, passage of deep-draft vessels through the waterway can suddenly change water level and flow or create wakes, causing booms to fail. For these reasons, recovery efforts must be coordinated through the Unified Command to ensure the cooperation of all parties involved.

Containment Methods

Containment techniques in an urban area depend greatly on the ability to deploy equipment due to obstacles presented by the urban area. Most booming and containment techniques will work with slight modifications such as direct anchoring instead of the use of booming buoys. Often, debris and other obstacles cause gaps in containment or clog up the flow of oil in diversion booming. Vessel traffic can also cause containment to fail, due to splash over from vessel wakes.

Removal Methods

Normal recovery techniques work when recovering oil in an urban area. However, recovery can be hampered by several situations. Floating debris clogging skimming equipment is the main cause for low recovery rates. Another problem for recovery in an urban area is lack of storage space. Often traffic problems or lack of access prevent storage equipment such as frac tanks and vacuum trucks from approaching the recovery zone.

Spill Under Ice

Containment Methods

The traditional strategy for dealing with oil under the ice in a river or lake is to cut a slot to aid in recovery. Ice slots can be cut using chain saws, handsaws, ice augers or some form of trencher. Another effective variation of this technique is the diversionary plywood barrier method which is also discussed below. See Figure 4.1 for on-water decision tree.

Removal Methods

Ice slotting is a very basic technique used to gain access to oil trapped beneath the ice. In ice slotting, a J shaped outline is sketched into the ice at a 30 degree angle to the current. The slight J hook or curve is necessary at the upstream side to provide flow towards the recovery area. In general, the slot width should be 1.5 times the thickness of the ice. Remember, a block of ice is heavy and the width of the slot must be taken into consideration so it can be safely removed or pushed under if the water beneath the ice is sufficiently deep. The length of the slot will be determined by the width of the river and strategy.

This technique is a successful strategy to implement. However, there are a few pit falls to be aware off. First, responders will fatigue rapidly if required to cut the slot or slots by hand using a chain saw or hand held saw. This can present a problem if there are not a sufficient number of Hazmat technicians available. Secondly, when cutting with chain saws, large volumes of water are kicked up by the moving chain onto the responder. This is a safety problem when the responders get wet in extreme cold weather conditions. Wearing rain gear however can reduce this problem.

A second technique is to slot the ice and use plywood to help divert oil beneath the ice to a recovery area. This technique is called the diversionary plywood barrier method. In this technique, a narrow slot is made through the ice and 4' x 8' sheets of plywood or equivalent are dropped into the slot to create a barrier and force the oil to follow along it to the collection area. This is the same principal employed when using floating boom.

The slot can be cut or drilled depending on the equipment available at the time of the response. If drilling is required, a gas powered ice auger can be used. In this scenario a series of 8" or 10" holes are drilled next to each other in the J pattern.

A chain saw can be used to connect the holes if an ice bridge exists between two auger holes. After the ice auguring is complete, plywood can be dropped into the augured slot.

Again, river ice is dirty and chipper blades on the augers may only last long enough to complete a single auger hole. This technique requires a large inventory of chipper blades. Extra auger flights can be used, which reduces down time to change blades. A real plus to slotting the ice with an ice auger is the limited exposure of responders to water. The water is generally restricted to the area around the responder's feet.

If an ice auger is not available, a chain saw can be used to cut a narrow slot. After the slot has been cut and ice removed, plywood can be inserted. When using a chainsaw that makes a 3/8" cut, a 1/8"-1/4" plywood or outdoor siding can be inserted into the slot and effectively be used to create the barrier. Again, the down side when using a large chain saws is fatigue and splash from water being kicked up by the chain. However, this problem is not as bad as cutting large slots as described above. Since only a single slot is made, the number of responders can be reduced and extra personal protective equipment in the form of rain gear can be used to minimize the water splash.

Spill on Ice

When managing an oil spill on ice special consideration must be given to several safety factors. Thickness of the ice and general accessibility of equipment must be considered when planning for on-ice recovery. Ice that is too thin to safely traverse or broken ice may prevent active recovery.

Containment Methods

For ice-covered on-land or on-water spills, snow or earthen berms may be constructed to contain oil around the leak, if terrain permits. Dikes filled with sorbent materials may be used on spills in smaller streams to create a manmade dam to prevent the further migration of the oil.

Oil may become encapsulated due to melting and refreezing of the ice. Oil may then be more difficult to access and remove. See Figure 4.1 for on-water recovery decision tree.

Removal Methods

Generally, on-ice recovery consists of the manual removal of the product from the spill site. If conditions permit, vacuum trucks or suction pumps may be used to remove pools of oil that may have collected. Often, product removal will be done by hand using brooms, shovels and rakes. Manually moving the oil/snow mixture into piles for collection where it is either vacuum or manually collected into storage containers.

Spill in Wetland Areas

Wetlands, which include upland and inland marshes, swamps and bogs, are highly sensitive to spills because they collect run-off from surrounding environments, and because they are home to many commercially and ecologically important species. Wetlands are very susceptible to damage and are a high priority to protect. Precautions should be taken so that the recovery effort does not cause more damage than that cause by the release.

Containment Methods

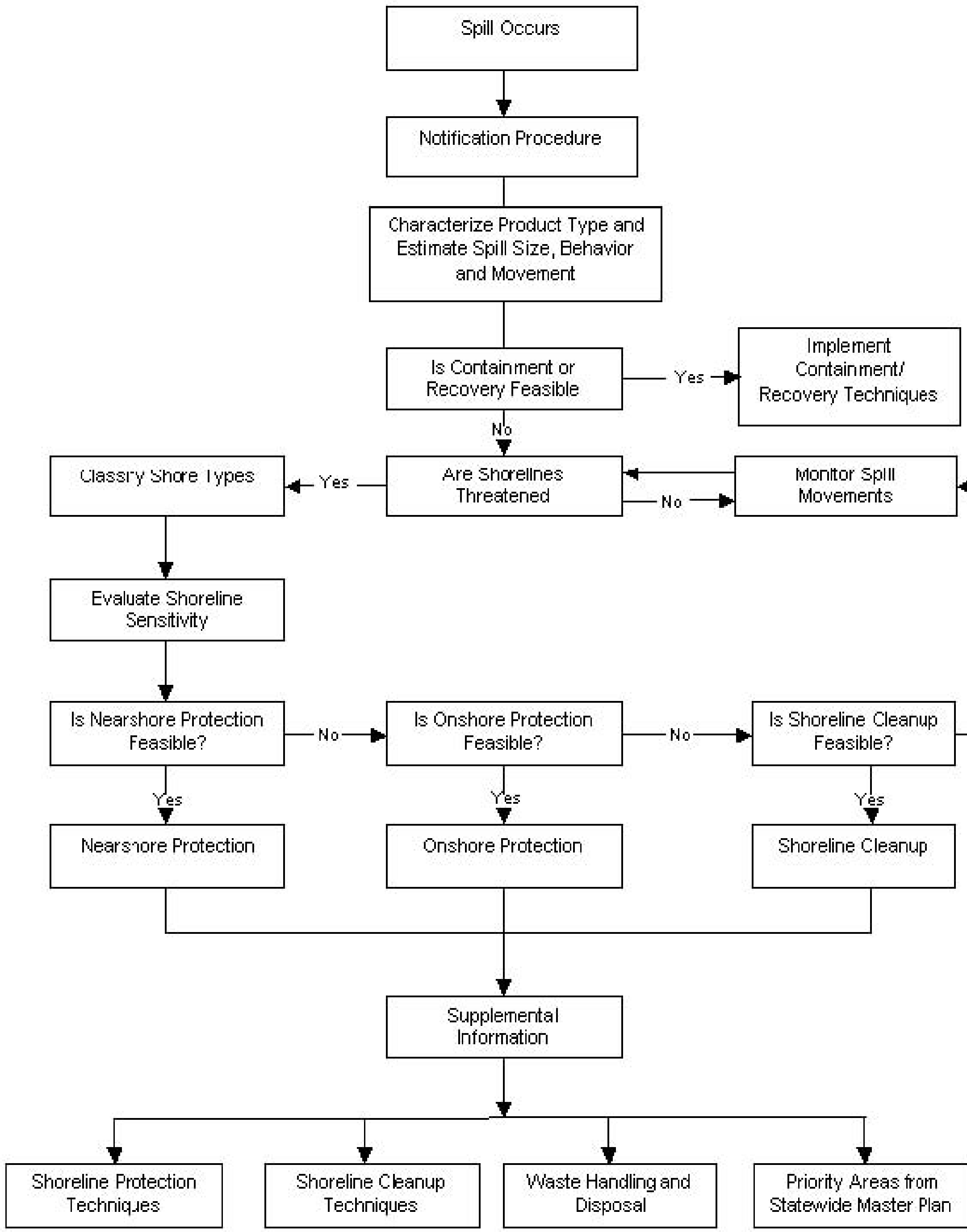
Containment booms can be strategically deployed to contain or divert the product into recovery areas where skimmers and vacuums can be used to remove the product. Berms can also be built to contain or divert the product. Consideration must be given to the damage that can be caused by holding the product in the wetland areas. Often, allowing the product to flow to natural collection areas and possibly assisting the flow by the use of high volume low pressure water pumps may be the best course of action.

Removal Methods

Skimmers and vacuums can be deployed to recover contained oil. Other acceptable response techniques might include bioremediation, sorbents and in-situ burning. The use of heavy equipment is often not practical because of the damage it can cause to plant and animal life. During recovery, specially designed flat bottom shallow draft vessels and the use of plywood or boards may be used to reduce the damage caused by recovery personnel. If the water table is high and the oil will not permeate the soil, shallow trenches may be dug to collect oil for removal.

The Unified Command must balance the need to remove the product with the damage caused by active removal. Considerations for long term passive recovery should be considered.

FIGURE 4.1
ON WATER RESPONSE FLOWCHART



4.6 VULNERABILITY ANALYSIS

A thorough examination of published Area Contingency Plans (ACPs) was conducted to identify sensitive areas in all the response zones.

The Environmental Sensitivity Maps will be created using this data.

4.7 ALTERNATIVE RESPONSE STRATEGIES

There are no pre-approved response options for inland spills within the United States. Any plans to use dispersants or in situ burn by the Company will be submitted to the Federal On-Scene Coordinator for Regional Response Team approval prior to such action being taken.

IN SITU BURNING

When considering the use of in situ burning the following considerations should be evaluated. In most cases, an agency application with further considerations will need to be completed before burning will be approved by the agency.

Size, Nature, and Product Spilled

- Flammability of the product. (Will the product burn?)
- Location of spill. (Distance and direction to nearest human use areas.)
- Volume of product released.
- Estimate of the surface area covered by the spill.
- How long has oil been exposed?
- Will burning cause more hazardous by-products?

Weather and Forecast

- Current weather conditions. (Rain / Heat)
- Wind speed and direction.
- 24 hour forecast.
- 48 hour forecast.

Evaluate the Response Operations

- Is there time enough to conduct burning?
- Is safety equipment available?
- Is adequate personnel available for monitoring / emergency response?
- Is mechanical recovery more intrusive than burning?

Habitats Impacted and Resources at Risk

- Have local agency / Officials been contacted.
  - Public Health
  - Land Owner / Manager
  - Local Fire Management (Fire Marshall)
  - Historic Property Specialist
  - Province / State Resource Agency
  - Aboriginal / Native American interests

- What is / will be the impact to surface water intakes and wells.
- Are endangered habitats / endangered species present?
- Is area used by Migratory Animals?
- What wildlife is present?

Burn Plan

- How much of the oil is expected to burn?
- How long will it be expected to burn?
- How will burn be ignited?
- How will burn be extinguished?
- How will burned oil residue be collected?
- What are the monitoring protocols?

DISPERSANT USE

Dispersants are not commonly used on inland spills. Working closely with Federal, Province / State and local agencies will be necessary for gaining approval to use dispersants. Since dispersants do not eliminate the oil, only break up and spread the oil throughout the water column, it is important to look at the total effect the oil will have on the environment while considering the use of dispersants.

APPENDIX A

RESPONSE EQUIPMENT/RESOURCES

A.1 COMPANY OWNED RESPONSE EQUIPMENT

The Company owns and operates oil spill response equipment contained within response trailers staged throughout the pipeline system. This equipment is maintained according to manufacturer's recommendations by Company and/or contracted personnel. An equipment summary detailing locations, type and amount stored in the response trailers is listed in Figure A.1. The Company also has contracts in place with Oil Spill Removal Organizations and other clean-up contractors that are capable of responding to all discharges along the Pipeline. Figure A.2 lists the contracted Oil Spill Removal Organizations.

20' boom trailers are located at the Hardisty Pump Station (Alberta), Regina Pump Station (Saskatchewan), in Valley City (North Dakota) at an external contractor site, and in Brookings (South Dakota) at a TransCanada office location.

The Qualified Individual has the authority to activate other private contractors, experts, and consultants as the situation demands.

All Pipeline personnel who might be involved in an oil spill have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water and that dispersants can only be used with the approval of the Canadian Regional Environmental Emergency Team (REET) or US Regional Response Team, the interagency group composed of Federal and State agency representatives that coordinates oil spill response.

A.2 OTHER COMPANY RESOURCES

Additional Company spill response equipment and manpower resources are not available to supplement the response operation; however, third party contractors will be activated on an as needed basis.

A.3 CONTRACT RESOURCES

The resources will be secured from a Company approved contractor. Management will typically handle notification/implementation of these resources. Figure A.2 provides a quick reference to the Oil Spill Removal Organizations and details their response capability and estimated response times. Telephone reference is provided in Figure 1.5. (Note: The *<u>Company</u> will ensure that each OSRO has a comprehensive maintenance program and applicable training / drills programs in place at contract renewal.)*

A.4 COOPERATIVE/MUTUAL AID RESOURCES

The Company is a member of the following Oil Spill Cooperatives or mutual aid groups:

- Western Canadian Spill Services Ltd.
- Alberta -Area U and S Oil Spill Cooperatives
- Saskatchewan -Area 3, 6, and 4 & 5 Oil Spill Cooperatives

A.5 VOLUNTEERS

Volunteers will not be utilized by the Company for the response operations. In the U.S., all volunteers will be referred to the Federal Regional Response Team.

A.6 COMMUNICATIONS

Effective and efficient communications systems are essential for emergency response at every level. The communications system will be utilized to gather information and current status reports as well as to provide coordination and direction to widely separated work groups involved in search, containment/diversion, repair, traffic control, public control or evacuation, and restoration.

The Company's overall Emergency Notification Chart (Figure 1.2) indicates individuals within the Company and governmental agencies (Figure 1.5) who must be contacted in the event of an emergency.

Notification information for the Qualified Individuals, Alternate Qualified Individuals, emergency response contractors, and governmental agencies is located in Section 1.0 and the Response Zone Annexes.

Lines of communication between the Incident Commander, local personnel, and contractors are demonstrated in the organization charts provided in Figures 3.1 and 3.2. Communication of the overall spill response operation between the Company and the responsible government agencies will occur between the Incident Commander and the Federal On-Scene Coordinator.

Central Communications System

Prearranged communication channels are of the utmost importance in dealing with Company emergencies. The notification procedures and telephone contacts documented in Section 1.0 will be reviewed in accordance with the earlier documented updating procedures. The predetermined communications channels include the following:

- A list of emergency telephone numbers for internal management and emergency response personnel (Figures 1.2 and 1.5).
- A list of emergency telephone numbers for various external resources such as the Fire Departments, Public Officials and local agencies is provided in the Annexes.
- A list of emergency telephone numbers for contract response resources (Figure 1.5).

Communications Equipment

Field communications during a spill response will be handled via radios, telephones, cellular phones, fax machines, and computers and will be maintained by Company personnel. In the event of a Worst Case Discharge, field communications will be enhanced with contract resources as the situation demands.

Communications Type

Voice communications may be conducted over the public telephone system or Company provided two-way radio equipment.

Radios - Hand-held and vehicle-mounted radio sets are the most effective means of communication for the field response operation. The units are battery operated, multi-channeled, and have a typical range that will cover the area of the response operation. Additional radio sets and battery packs/charges will be necessary in the event of a prolonged response operation.

Telephone (Conventional) - Conventional land line telephones are the most effective means of communication for regulatory and advisory notifications during a spill response operation. Additional telephone lines can be installed in the event of a prolonged response operation. All major facilities have access to standard telephone service.

Cellular - Cellular telephones are useful during spill events giving the user the ability to travel while using the communication system.

FAX Machines - FAX machines allow for a rapid transfer of information/documentation such as status reports/updates, written notifications, and purchase orders. All administrative offices have facsimile machines.

Computers - Computers are commonly used in networks which allow access to various other locations and company personnel. Computers also speed the consolidation of information and preparation of a written report.

FIGURE A.1
COMPANY OWNED SPILL RESPONSE EQUIPMENT

COMPANY OWNED RESPONSE EQUIPMENT	
5 SPILL RESPONSE TRAILERS (ONE PER RESPONSE ZONE)	
Description	**Quantity**
Response boat 18.5 foot work boat with a 60 HP outboard	1
Jon boat 14 foot Safety boat with a 9.9 hp	1
34 ft Equipment trailer with 6 ft office includes equipment shelving, heat lights, power awning, rear ramp door and 1 side door. Roof rack for storage of the 14' boat and 500ft boom.	1
River Boom 6" x 6'	500 ft
Portable dam 50 ft	1
Diesel /hydraulic Skimming System with diesel power transfer pump and hoses	1
Sorbent pads	5 bales
Sorbent boom	5 bales
500 gallon portable tank	1
2,000 gallon portable tank	1
10,000 gallon portable bladder	1
Winter equipment(e.g. Chain saws, chains, pry bars, ropes, ice, augers)	varies
Bird Hazing Kit	1
20' boom Trailer	1

FIGURE A.2
RESPONSE RESOURCES
Zone : Not determined

Area : Not determined						
OSRO Name	**Contract Number**	**Environment Type**	**Facility Classification Level**			
			MM	**W1**	**W2**	**W3**
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

FIGURE A.3
USCG OSRO CLASSIFICATIONS

The USCG has classified OSROs according to their response capabilities, within each Captain of the Port (COTP) zone, for vessels and for facilities in four types of environments. Response capabilities are rated MM, W1, W2, or W3 as described below:

MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Rivers/Canals			
MM	Protective Boom: 4,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports:12 hours Other Ports: 24 hours
W1	Protective Boom: 25,000*ft EDRC:; 1,875 bbls TSC: 3,750 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports:12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC:; 3,750 bbls TSC: 7,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports:36 hours Other Ports: 48 hours
W3	Protective Boom:25,000*ft EDRC:; 7,500 bbls TSC: 15,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports:60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 6,000*ft EDRC:; 1,250 bbls TSC: 2,500 bbls	All Ports: 6 hours	All Ports: 12 hours
W1	Protective Boom:30,000*ft EDRC:; 6,250 bbls TSC: 12,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports:12 hours Other Ports: 24 hours
W2	Protective Boom:30,000*ft EDRC:; 12,500 bbls TSC: 25,000 bbls	All Ports: 36 hours	All Ports: 42 hours
W3	Protective Boom:30,000*ft EDRC:; 25,000 bbls TSC: 50,000 bbls	All Ports: 60 hours	All Ports: 66 hours

MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Inland			
MM	Protective Boom:6,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC:; 50,500 bbls TSC: 100,500 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 8,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Location: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC:; 25,500 bbls TSC: 50,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 30,000*ft EDRC:; 50,000 bbls TSC: 100,000 bbls	(for open ocean, plus travel time from shore) High Volume Ports: 54 hours Other Location: 60 hours	(for open ocean, plus travel time from shore) High Volume Ports: 60 hours Other Location: 72 hours

MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Offshore			
MM	Protective Boom:6,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports:6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 15,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports:24hours Other Ports: 48hours	High Volume Ports: 24 hours Other Ports: 48 hours
W2	Protective Boom: 15,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports:30hours Other Ports: 36hours	High Volume Ports: 36hours Other Ports: 48hours
W3	Protective Boom: 15,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports:54hours Other Ports: 60hours	High Volume Ports: 60hours Other Ports: 72hours
Open Ocean			
MM	Protective Boom: 0*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports:6hours Other Ports: 12hours	High Volume Ports: 12hours Other Ports: 24hours
W1	Protective Boom: 0*ft EDRC: 12,500 bbls TSC: 25,000 bbls	High Volume Ports:6hours Other Ports: 12hours	High Volume Ports: 12hours Other Ports: 24hours
W2	Protective Boom: 0*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports:30hours Other Ports: 36hours	High Volume Ports: 36hours Other Ports: 48hours
W3	Protective Boom: 0*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports:54hours Other Ports: 60hours	High Volume Ports: 60hours Other Ports: 72hours

1. Rivers/canals include bodies of water, including the Intracoastal Waterway and other bodies artificially created for navigation, confined within an inland area and having a project depth of 12 feet (3.66 meters).
2. EDRC stands for "effective daily recovery capacity," or the calculated recovery capacity of oil recovery devices determined by using a formula that takes into account limiting factors such as daylight, weather, sea state, and emulsified oil in the recovered material.
3. TSC stands for "temporary storage capacity," meaning sufficient storage capacity equal to twice the EDRC of an OSRO. Temporary storage may include inflatable bladders, rubber barges, certified barge capacity, or other temporary storage that can be utilized on scene at a spill response and which is designed and intended for the storage of flammable or combustible liquids. It does not include vessels or barges of opportunity for which no pre-arrangements have been made. Fixed shore-based storage capacity, ensured available by contract or other means, will be acceptable.

* In addition, 1,000 feet of containment boom plus 300 feet per skimming system.

FIGURE A.4
AGREEMENTS/CONTRACTS

NRC Packet

Decision Summary (DS-244)

TransCanada
In business to deliver

To:	Richard Prior	**Date:**	October 14, 2008
From:	John Hayes	**Location:**	Calgary, Alberta
Subject:	NRC OSRO Resource Retainer		

Decision Proposed ($125,000 per Annum(U.S. Currency) for 3 years)

Your approval is requested for funds related to emergency response planning and preparedness. As a matter of risk mitigation and regulatory compliance, it is proposed to enter into a contractual retainer to address a number of emergency response functions during operations. This amount falls within the existing capital expenditures for emergency response for 2009.

Background

National Response Corporation (NRC) will provide Keystone with Oil Spill Response Organization (OSRO) resources. Specifically, NRC will be the overall coordinating company that has the ability to safely respond to spill related incidents along the pipeline. NRC ensures spill readiness which included supplier subcontracts, training, workshops and overall spill site coordination. NRC has the proven ability to handle spills of all sizes and is approved by the United States Coastguard.

NRC has its own equipment, spill managers and a network of related industries to ensure Keystone is prepared to respond efficiently and effectively. The retention of a contractor is mandatory for Keystone to meet regulatory requirements. Having a retainer guarantees Keystone the resources when most needed.

The contract should start on January 1, 2009 and will form part of the existing Emergency Response Plan for 2009. This type of contract was not contemplated in the original Emergency Response budget of 3MM, but is part of the overall plan. The first year will be absorbed by the existing budget and for future years, these costs should be part of a field operations budget.

Requested by:

John Hayes – Operations Manager Keystone Pipeline	14 October 2008 Date

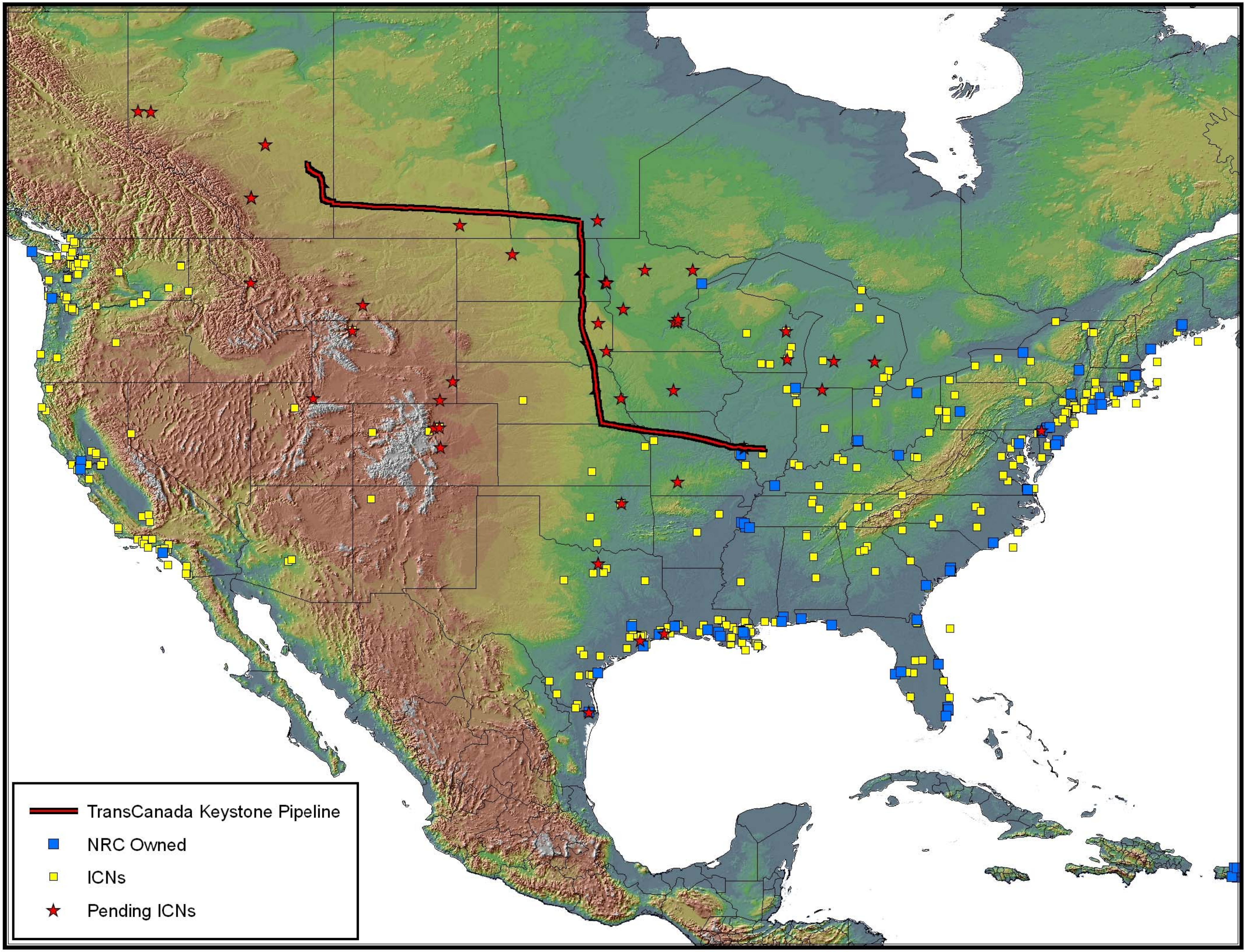
Approved by:

Rob Sillner Integration Manager, Keystone Pipeline	14 October 2008 Date

National Response Corporation, Inc.

National Response Corporation, Inc. is an Oil Spill Response Organization contracted to conduct oil recovery for TransCanada Keystone Limited Partnership and TC Oil Pipeline Operations, Inc. National Response Corporation uses a network of associated cleanup contractors throughout North America and the world. National Response Corporation has been certified by the United States Coast Guard, as described in the Emergency Response Manual, to respond to releases along the length of the Pipeline.

For further information about National Response Corporation and a list of response equipment you can visit their website at http://www.nrcc.com.



TransCanada Keystone Pipeline
NRC Owned
ICNs
Pending ICNs

APPENDIX B

DISPOSAL PLAN

B.1 OVERVIEW

A major oil spill response would generate significant quantities of waste materials ranging from oily debris and sorbent materials to sanitation water and used batteries. All these wastes need to be classified and segregated (i.e., oily, liquid, etc.), transported from the site, and treated and/or disposed at approved disposal sites. Each of these activities demands that certain health and safety precautions be taken, which are strictly controlled by Federal and State Laws and Regulations. This Section provides an overview of the applicable State Regulations governing waste disposal, and a discussion of various waste classification, handling, transfer, storage, and disposal techniques. It is the responsibility of the Environmental Unit to manage waste disposal needs during an oil spill cleanup.

B.2 WASTE CLASSIFICATION

Oily-Liquid Wastes

Oily liquid wastes (i.e., oily water and emulsions) that would be handled, stored, and disposed during response operations are very similar to those handled during routine storage and transfer operations. The largest volume of oily liquid wastes would be produced by recovery operations (e.g., through the use of vacuum devices or skimmers). In addition, oily water and emulsions would be generated by vehicle operations (e.g., spent motor oils, lubricants, etc.), and equipment cleaning operations.

Non-Oily -Liquid Wastes

Response operations would also produce considerable quantities of non-oily liquid wastes. Water and other non-oily liquid wastes would be generated by the storage area and stormwater collection systems, equipment cleaning (i.e., water contaminated with cleaning agents), and office and field operations (i.e., sewage, construction activities).

Solid Wastes

A solid waste is defined as any discarded material provided that it is not specifically excluded under the regulations. These exclusions cover materials such as domestic sewage and mixtures of sewage discharged through a sewer system or industrial wastewater point source discharges.

A discarded material is any material which is abandoned (disposed, burned or incinerated) or accumulated, stored or treated prior to being abandoned. A discarded material is also any material recycled or any material considered inherently wastelike. Recycled material is considered solid waste when used in a manner constituting disposal, placed on land or burned for energy recovery.

A solid waste may be considered a hazardous waste. A solid waste, as defined above, may be a hazardous waste if it is not excluded from regulation and is either a listed hazardous waste or exhibits the characteristics of a hazardous waste. A solid waste exhibits the characteristics of a hazardous waste if it exceeds the thresholds established in determining the following:

1. Ignitability
2. Corrosivity
3. Reactivity
4. Toxicity

A solid waste may also become a hazardous waste if it is mixed with a listed hazardous waste or, in the case of any other waste (including mixtures), when the waste exhibits any of the characteristics identified above.

Oily -Solid / Semi-Solid Wastes

Oily solid/semi-solid wastes that would be generated by containment and recovery operations include damaged or worn-out booms, disposable/soiled equipment, used sorbent materials, saturated soils, contaminated beach sediments, driftwood, and other debris.

Non-Oily -Solid / Semi-Solid Wastes

Non-oily solid/semi-solid wastes would be generated by emergency construction operations (e.g., scrap, wood, pipe, and wiring) and office and field operations (i.e., refuse). Vessel, vehicle, and aircraft operations also produce solid wastes.

B.3 WASTE HANDLING

A primary concern in the handling of recovered oil and oily debris is contaminating unaffected areas or recontaminating already cleaned areas. Oily wastes generated during the response operations would need to be separated by type and transferred to temporary storage areas and/or transported to incineration or disposal sites. Proper handling of oil and oily wastes is imperative to ensure personnel health and safety.

Safety Considerations

Care shall be taken to avoid or minimize direct contact with oily wastes. All personnel handling or coming into contact with oily wastes shall wear protective clothing. A barrier cream can be applied prior to putting on gloves to further reduce the possibility of oily waste absorption. Safety goggles shall be worn by personnel involved in waste handling activities where splashing might occur. Any portion of the skin exposed to oily waste should be washed with soap and water as soon as possible. Decontamination zones should be set up during response operations to ensure personnel are treated for oil exposure.

Wastes Transfer

During response operations, it may be necessary to transfer recovered oil and oily debris from one point to another several times before the oil and oily debris are ultimately recycled, incinerated or disposed at an appropriate disposal site. Depending on the location of response operations, any or all of the following transfer operations may occur:

- From portable or vessel-mounted skimmers into flexible bladder tanks, storage tanks of the skimming vessel itself, or a barge.
- Directly into the storage tank of a vacuum device.
- From a skimming vessel or flexible bladder to a barge.
- From a vacuum device storage tank to a barge.
- From a barge to a tank truck.
- From a tank truck to a processing system (e.g., oil/water separator).
- From a processing system to a recovery system and/or incinerator.
- Directly into impermeable bags that, in turn, are placed in impermeable containers.
- From containers to trucks.

There are four general classes of transfer systems that may be employed to affect oily waste transfer operations:

- **Pumps:** Rotary pumps, such as centrifugal pumps, may be used when transferring large volumes of oil, but they may not be appropriate for pumping mixtures of oil and water. The extreme shearing action of centrifugal pumps tends to emulsify oil and water, thereby increasing the viscosity of the mixture and causing low, inefficient transfer rates. The resultant emulsion would also be more difficult to separate into oil and water fractions. Lobe or "positive displacement" pumps work well on heavy, viscous oils, and do not emulsify the oil/water mixture. Double-acting piston and double acting diaphragm pumps are reciprocating pumps that may also be used to pump oily wastes.
- **Vacuum Systems:** A vacuum truck may be used to transfer viscous oils but they usually pick up a very high water/oil ratio.
- **Belt/Screw Conveyors:** Conveyors may be used to transfer oily wastes containing a large amount of debris. These systems can transfer weathered debris laden oil either horizontally or vertically for short distances (i.e., 10 feet) but are bulky and difficult to set up and operate.
- **Wheeled Vehicles:** Wheeled vehicles may be used to transfer liquid wastes or oily debris to storage or disposal sites. These vehicles have a limited transfer volume (i.e., 100 barrels) and require good site access.

B.4 WASTE STORAGE

Interim storage of recovered oil, oily and non-oily waste would be considered to be an available means of holding the wastes until a final management method is selected. In addition, the segregation of wastes according to type would facilitate the appropriate method of disposal. The storage method used would depend upon:

- The type and volume of material to be stored.
- The duration of storage.
- Access.

During an oil spill incident, the volume of oil that can be recovered and dealt with effectively depends upon the available storage capacity. Typical short-term storage options are summarized in Figure B.1. The majority of these options can be used either onshore or offshore.

If storage containers such as bags or drums are used, the container must be clearly marked with the proper Canadian Transport Dangerous Goods/United States Department of Transportation marking to indicate the type of material/waste contained and/or the ultimate disposal option.

Fuel barges may be the best option for temporary storage of oil recovered in open waters and frac tanks for inland spills. Depending on size, these vessels may be able to hold up to 6,000 barrels of oil and water and frac tanks may hold up to 500-550 barrels. The barge deck can be used as a platform for operating oil spill clean-up equipment and storing containment boom.

Steel or rubber tanks can be used to store oil recovered near the shoreline. To facilitate offloading, demulsifiers may be used to break emulsions prior to placing the recovered substance into the barges or storage tanks.

Use of any site for storage is dependent on the approval of the local authorities. The following elements affect the choice of a potential storage site:

- Geology
- Ground water
- Soil
- Flooding
- Surface water
- Slope
- Covered material
- Capacity
- Climatic factors
- Land use
- Toxic air emissions
- Security
- Access
- Public contact

B.5 WASTE DISPOSAL

Techniques for Disposal of Recovered Oil

Recovery, reuse, and recycling are the best choices for remediation of a spill, thereby reducing the amount of oily debris to be bermed onsite or disposed of at a solid waste landfill. Treatment is the next best alternative, but incineration and burning for energy recovery have more options within the state. There are some limitations and considerations in incinerating for disposal. Environmental quality of incineration varies with the type and age of the facility. Therefore, when incineration becomes an option during an event, local air quality authorities would be contacted for advice about efficiency and emissions of facilities within their authority. Approval of the local air authorities is a requirement for any incineration option. Landfilling is the last option. Final disposal at a solid or dangerous waste landfill is the least environmentally sound method of dealing with a waste problem such as oily debris.

Note: Prior to the disposal of ANY waste products, the Incident Commander or his designee must contact the Keystone / TransCanada Community, Safety and Environmental Department to receive direction and guidance on the proper disposal methods and procedures.

During an oil spill incident, the Company would consult with the proper regulating agency to identify the acceptable disposal methods and sites appropriately authorized to receive such wastes. The Company maintains a list of approved disposal sites that satisfy local, Province/State, and Federal

Regulations and Company requirements: This identification of suitable waste treatment and disposal sites would be prepared by the Environmental Unit in the form of an Incident Disposal Plan which must be authorized by the U.S. Coast Guard and/or the Environmental Protection Agency or National Energy Board.

An Incident Disposal Plan would include predesignated interim storage sites, segregation strategies, methods of treatment and disposal for various types of debris, and the locations/contacts of all treatment and disposal site selections. Onsite treatment/disposal is preferred.

In order to obtain the best overall Incident Disposal Plan, a combination of methods should be used. There is no template or combination of methods that can be used in every spill situation. Each incident should be reviewed carefully to ensure that an appropriate combination of disposal methods is employed.

The different types of wastes generated during response operations would require different disposal methods. To facilitate the disposal of wastes, they should be separated by type for temporary storage, transport and disposal. Figure B.2 lists some of the options that would be available to segregate oily wastes. The figure also depicts methods that may be employed to separate free and/or emulsified water from the oily liquid waste.

The following is a brief discussion of some disposal techniques available for recovered oil and oily debris.

Recycling

This technique entails removing water from the oil and blending the oil with uncontaminated oil. Recovered oil can be shipped to refineries provided that it is exempt from hazardous waste regulations. There it can be treated to remove water and debris, and then blended and sold as a commercial product.

The Company's designated Disposal Specialist is responsible for ensuring that all waste materials be disposed at an internally approved disposal site.

Incineration

This technique entails the complete destruction of the recovered oil by high temperature thermal oxidation reactions. There are licensed incineration facilities as well as portable incinerators that may be brought to a spill site. Incineration may require the approval of the local Air Pollution Control Authority. Factors to consider when selecting an appropriate site for onsite incineration would include:

- Proximity to recovery locations.
- Access to recovery locations.
- Adequate fire control.
- Approval of the local air pollution control authorities.

In Situ Burning / Open Burning

Burning techniques entail igniting oil or oiled debris and allowing it to burn under ambient conditions. These disposal techniques are subject to restrictions and permit requirements established by federal, province/state and local laws. They would not be used to burn Polychlorinated biphenyls, waste oil containing more than 1,000 parts per million of halogenated solvents, or other substances regulated by the Environmental Protection Agency or Environment Canada. Permission for in situ burning may be difficult to obtain when the burn takes place near populated areas.

As a general rule, in situ burning would be appropriate only when atmospheric conditions will allow the smoke to rise several hundred feet and rapidly dissipate. Smoke from burning oil will normally rise until its temperature drops to equal the ambient temperature. Afterwards, it will travel in a horizontal direction under the influence of prevailing winds.

Landfill Disposal

This technique entails burying the recovered oil in an approved landfill in accordance with regulatory procedures. Landfill disposal of free liquids is prohibited by Federal Law in the United States.

With local health department approval, non-burnable debris which consists of oiled plastics, gravel and oiled seaweed, kelp, and other organic material may be transported to a licensed, lined, approved municipal or private landfill and disposed of in accordance with the landfill guidelines and regulations. Landfill designation would be planned only for those wastes that have been found to be unacceptable by each of the other disposal options (e.g., waste reduction, recycling, energy recovery). Wastes would be disposed only at Company-approved disposal facilities. The Disposal Specialist is responsible for ensuring that all waste materials are disposed at a Company internally approved disposal site. Disposal at a non-approved facility would require approval by the Disposal Specialist prior to sending any waste to such a facility.

FIGURE B.1
TEMPORARY STORAGE METHODS

CONTAINER	ONSHORE	OFFSHORE	SOLIDS	LIQUIDS	NOTES
Barrels	x	x	x	x	May require handling devices. Covered and clearly marked.
Tank Trucks	x	x		x	Consider road access. Barge-mounted offshore.
Dump/Flat Bed Trucks-Roll-offs	x		x		May require impermeable liner and cover. Consider flammability of vapors at mufflers.
Barges		x	x	x	Liquids only in tanks. Consider venting of tanks.
Oil Storage Tanks	x	x		x	Consider problems of large volumes of water in oil.
Bladders	x	x		x	May require special hoses or pumps for oil transfer.
Frac Tanks	x			x	Consider road access.

FIGURE B.2
OILY WASTE SEPARATION AND DISPOSAL METHODS

TYPE OF MATERIAL	SEPARATION METHODS	DISPOSAL METHODS
LIQUIDS		
Non-emulsified oils	Gravity separation of free water	Incineration Use of recovered oil as refinery/production facility feedstock
Emulsified oils	Emulsion broken to release water by: • heat treatment • emulsion breaking chemicals • mixing with sand • centrifuge • filter/belt press	Use of recovered oil as refinery/production facility feedstock
SOLIDS		
Oil mixed with sand and soil	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oils by sieving	Incineration Use of recovered oil as refinery/production facility feedstock Direct disposal Stabilization with inorganic material Degradation through land farming or composting
Oil mixed with cobbles or pebbles	Screening Collection of liquid oil leaching from materials during temporary storage Extraction of oil from materials by washing with water or solvent	Incineration Direct Disposal Use of recovered oil as refinery/production facility feedstock
Oil mixed with wood and sorbents	Screening Collection of liquid oil leaching from debris during temporary storage Flushing of oil from debris with water	Incineration Direct disposal Degradation through land farming or composting for oil mixed with seaweed or natural sorbents

APPENDIX C

BASICS OF OIL SPILL RESPONSE

C.1 DIKES, BERMS AND DAMS

Dikes, berms, and dams are land-based tactics, with the objective of containing spilled oil and limiting spreading of oil slicks, thus minimizing impacts to the environment. Dikes, berms and dams are embankment structures built-up from the existing terrain, placed to contain and accumulate oil for recovery. These barriers can serve to:

- Contain and stabilize a contaminated area.
- Contain or divert oil on water or oil that has potential to migrate.
- Create cells for recovery.
- Use natural depressions to act as containment areas for recovery.

The tactic may be deployed in association with a recovery tactic, such as Shoreline Recovery or On-land Recovery. Dikes, berms, and dams are most effective when placed before oil arrives. Dikes, berms, and dams can also be used to exclude oil from a sensitive area, which is covered in the Beach Berms and Exclusion Dams tactic. The tactic can also be used in conjunction with an excavation tactic to enhance containment volumes (see Pits, Trenches, and Slots). The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Plan a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy response resources.
4. Construct the containment structure and ensure it does not leak.
5. Consider the need to remove any water-bottom that may collect beneath the oil inside the structure.
6. Monitor the containment structure on an appropriate basis.
7. If oil collects in the structure, utilize an appropriate recovery system for removal.

Tactic Description

This tactic involves building an embankment perpendicular to the flow of the oil slick or around a contaminated area. Dike, berm, and dam structures can be constructed with a wide variety of materials including: soil, gravel, snow, sand bags, oil boom, timbers and logs. Selection of the construction material depends on the operating environment, location, available materials, and whether the structure is to be temporary or permanent. The containment area should be lined with an impermeable membrane, such as plastic sheeting, to keep oil and oily water from leaking or migrating into the soil. The structure may include a method to regulate flow, such as a weir or spill way. Dikes, berms, and dams can be built by manual labor or with earth-moving equipment depending on the location and available resources.

Deployment Configurations

BERMS

A containment berm can be constructed of available materials such as earth, gravel, or snow. Use earth-moving equipment or manual labor to construct the berm. Form the materials into a horseshoe shape ahead of the flow of oil. Use plastic sheeting to line the walls of a soil berm to prevent oil penetration. Sandbags filled with sand or other heavy material also make excellent containment barriers.

DAMS

An underflow dam can be used when there is too much water flow to allow for a complete blockage of a drainage channel. The dam is built of earth, gravel, or other barriers such as sandbags or plywood sheets. Wherever possible, line the upstream side of the dam with plastic sheeting to prevent erosion and penetration of oil into the dam material. Underflow dams use inclined culverts or pipes to move water downstream while leaving the spill contained behind the dam. The capacity of the pipe(s) should exceed the stream flow rate. It may be necessary to use pumps to remove water behind a dike. Valves or culvert plugs can also be used to control flow rate. Pipes must be placed on the upstream side of the dam, with the elevated end on the downstream side. Make sure that the upstream end of the pipe is submerged and below the oil/water interface. The height of the elevated downstream end of the pipe will determine the water level behind the dam.

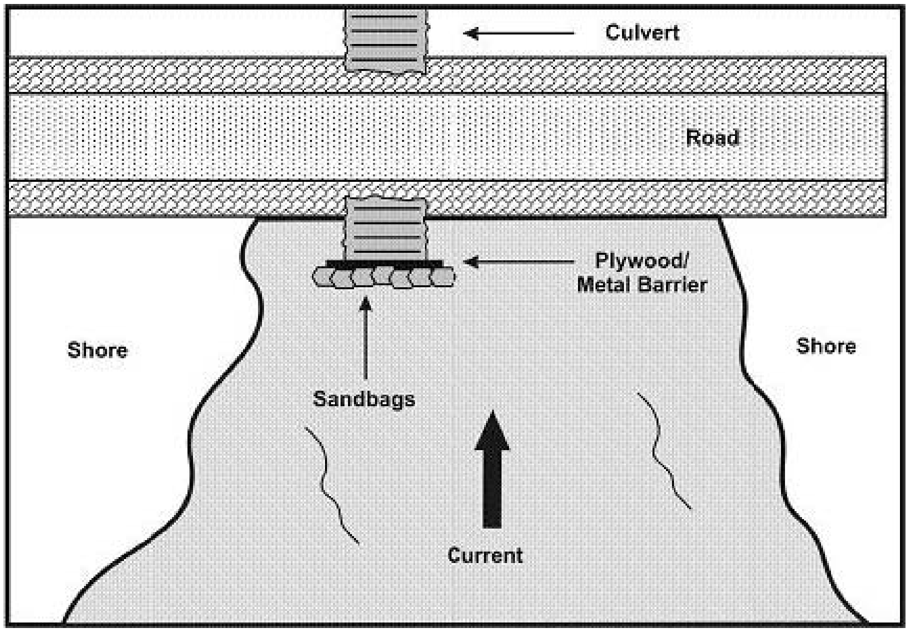
EXISTING ROADS

Roadways that are built up above the terrain can be used as dikes. However, road construction usually allows for natural drainage through culverts or bridges. These drainage structures must be controlled to turn the road into a barrier.

CULVERT BLOCKING

A culvert can be blocked using sheet metal, plywood barriers, or inflatable culvert plugs. Use a full block only when the culvert will be blocked for the entire cleanup operation, if the oil floating on the water will not contaminate additional soil or tundra, and if blocking the water flow will not threaten the road. Otherwise, an adjustable weir or culvert plug should be used. Plywood and/or sandbags can also be used as culvert blocks, but are more labor-intensive and pose a higher potential for injury. A wood block may require a headwall with kickers oriented to support the boards or plywood. Place the blocking materials over the upstream end of the culvert. Plastic sheeting over the outside of the block will prevent oil penetration.

FIGURE C.1
Culvert Blocking



EARTH MOVING EQUIPMENT

A bulldozer, road grader, or front-end loader drives around the spill with its blade angled towards the spill, pushing earth or snow into a berm. Once the perimeter has been covered with an initial berm, shore-up areas as necessary.

SNOW

Because of the absorbent quality of snow, it makes an excellent berm for both containment and recovery. A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow. A snow berm is built around the areas of heaviest oiling to contain oil or diesel spilled to tundra and/or ice in winter.

MESH FENCE

Plastic mesh fencing may be used to quickly construct an underflow dam system. The mesh fencing is placed across the drainage and held in place with stakes. Absorbent boom, oil boom, plywood, or even dry dead grass can be placed on the upstream side of the fencing. Running water will find its way under the barrier fence, but oil floating on top of the water will be trapped. The advantages of this system are that it is lightweight and mobile.

C.2 DEFLECTION BOOM

Objective & Strategy

The objective is to direct spilled oil away from a location to be protected or simply to change the course of the slick. "Deflection" is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom and then releasing it into the current again with a new trajectory. The angle is chosen to prevent oil from entraining beneath the boom skirt. Boom may be held in place by anchors, vessels, or a boom control device.

Deflection Boom may be used to temporarily avoid impacts to a sensitive area, but there is no recovery associated with the tactic, thus no oil is removed from the environment.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Identify, prioritize, and select sensitive areas to be protected from impact.
3. Select a deployment configuration that best supports the operating environment and available resources.
4. Mobilize to the location and deploy the tactic.
5. Place boom using secured anchor systems, mooring points, vessels, boom control devices, etc.
6. Monitor and adjust the boom on an appropriate basis.

BOOM ANGLE

Select the appropriate boom angle to keep oil from entraining under the boom. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

ANCHOR SYSTEMS

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating equipment.

DEPLOYMENT CONFIGURATIONS

Single Boom

Boom is deployed from a site at an optimum angle to the current and anchored to deflect the oil away from a location. Figures C.2 and C.3 illustrate two single boom deflection techniques.

FIGURE C.2
Deflective Booming Technique (Single Boom Method)

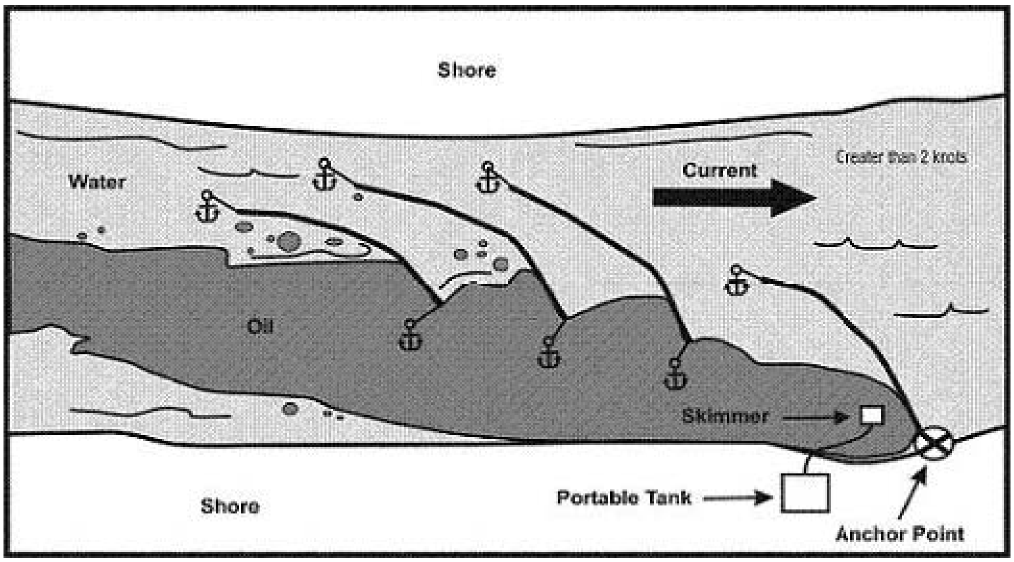


FIGURE C.3
Deflective Booming Technique (Single Boom Method)

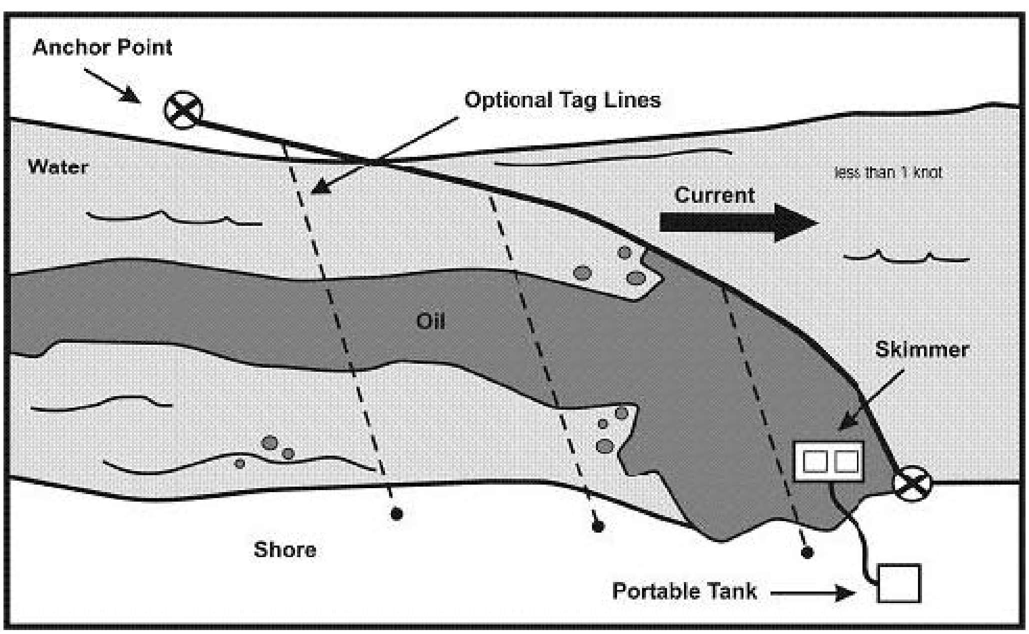
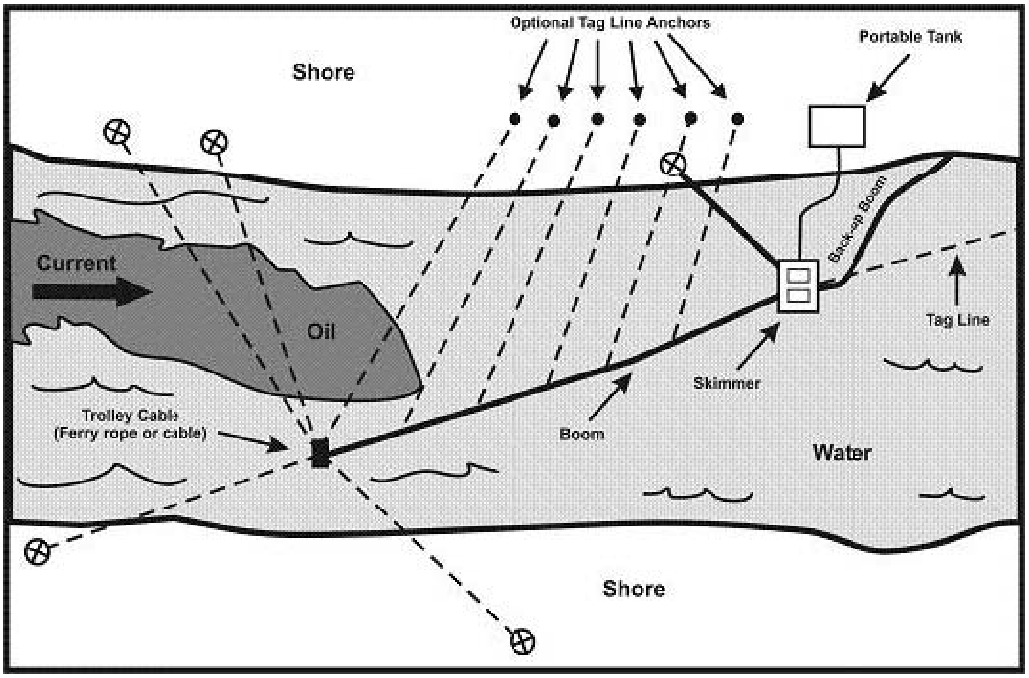


FIGURE C.4
Deflective Booming Technique (Cascade Method)



Cascade

Several booms are deployed in a cascade configuration when a single boom cannot be used because of fast current or because it is necessary to leave openings in the boom for vessel traffic, etc. This configuration can be used in strong currents where it may be impossible to effectively deploy one continuous section of boom. Shorter sections of boom used in a cascade deployment are easier to handle in faster water, thereby increasing efficiency. Additional equipment may be required to set and maintain this system as compared to the single boom configuration.

C.3 CONTAINMENT BOOM

Objective & Strategy

Containment booming is a fixed-boom tactic. The objective is to corral spilled oil on the water, usually near the source, thus minimizing spreading and impacts to the environment. It is usually deployed with Shoreline Recovery.

This tactic can be deployed for oil spill migrating downstream or downhill to water or through water.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Select a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy the tactic.
4. Place boom, using secure anchor system or mooring points.
5. Monitor the boom on an appropriate basis.
6. If oil collects in the boom, utilize an appropriate recovery tactic to remove it.

Tactic Description

Containment boom systems are comprised of the appropriate oil boom for containment and concentration, and anchoring systems to hold the boom in place.

Containment boom systems are not recommended for the fast water environment because of the high probability of fixed-boom failure and the difficulty of anchoring in this environment.

Containment boom systems are not recommended for the broken ice environment, because of the high probability of fixed-boom failure and loss due to ice encounters.

Anchoring systems are often deployed first and then the boom is set from one anchor to the adjacent anchor. Boom can be placed from shoreline to shoreline.

A second layer of containment boom, outside the primary boom, has two advantages:

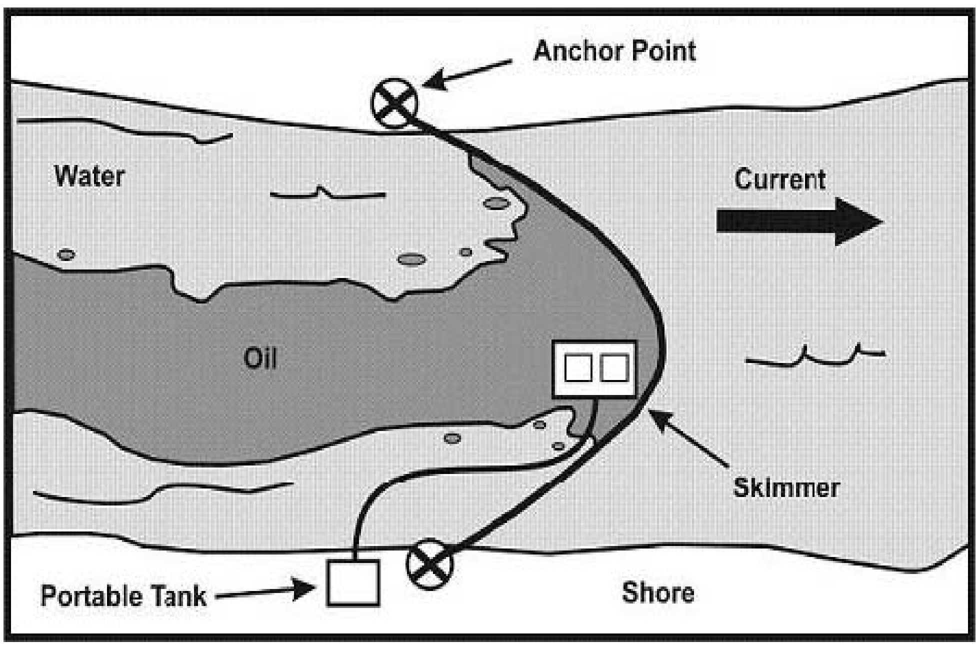
1. It breaks the sea chop and reduces its impact on the primary boom,
2. It may capture oil that has escaped if the primary boom fails.

Figure C.5 illustrates a simple containment booming technique.

Deployment Considerations

- It is often advisable to "line" the containment boom with sorbent materials (passive recovery) to recover the sheen and reduce decontamination costs.
- If the oil slick is moving, due to wind or current, consider containment at the source and ahead of the leading edge.
- If spill is moving in excess of 1 knot consider the Diversion Boom Tactic.
- Anchor systems must be selected based on the maximum stress that might be expected to occur on the boom array, considering stronger currents and winds than when the anchor is set.
- Site conditions will influence deployment configuration options.
- Combinations of Containment Boom and Diversion Boom tactics are often used together to optimize success.

FIGURE C.5
Containment Booming Technique (Catenary Method)



C.4 DIVERSION BOOM

Objective & Strategy

The objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. For the purposes of maintaining consistent and clear terms, diversion is always associated with oil recovery, in contrast with the term deflection, which is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The Diversion Boom tactic is for water-born spills where there is some current, usually from 0.5 to 3.0 knots. The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom to a recovery location. The angle is chosen to prevent oil from entraining beneath the boom skirt. Oil can be diverted to a shoreline or away from a shoreline or shoal waters. This tactic is always associated with a Shoreline Recovery. Figures C.6 and C.7 illustrate two diversionary booming techniques. These techniques are the Open Chevron and the Closed Chevron technique respectively.

FIGURE C.6
Open Chevron Booming Technique

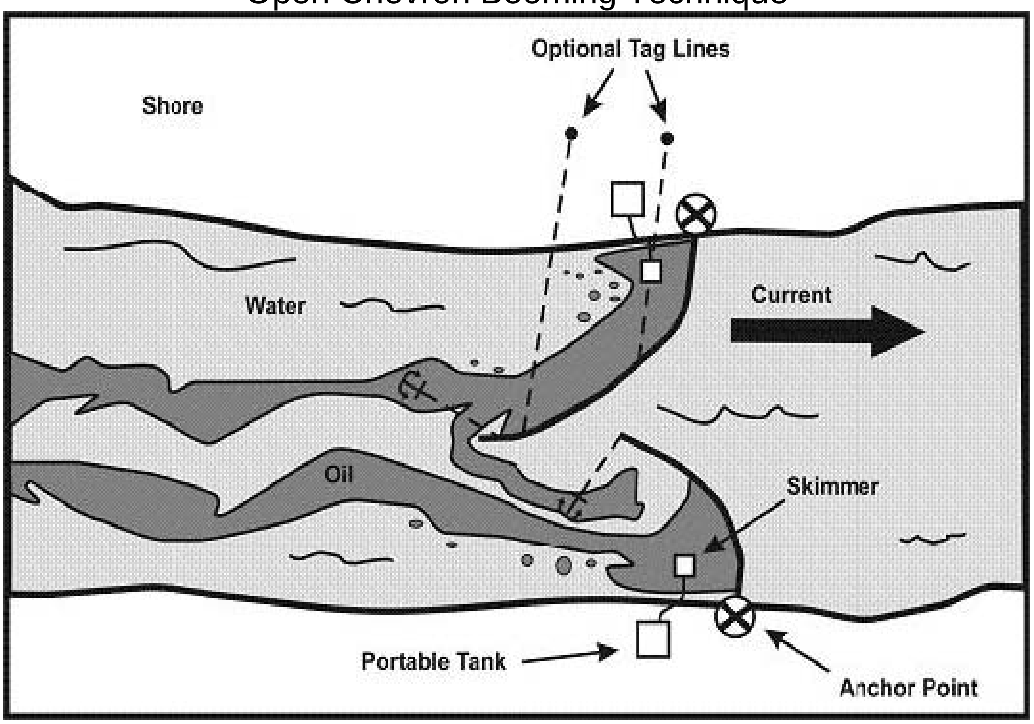
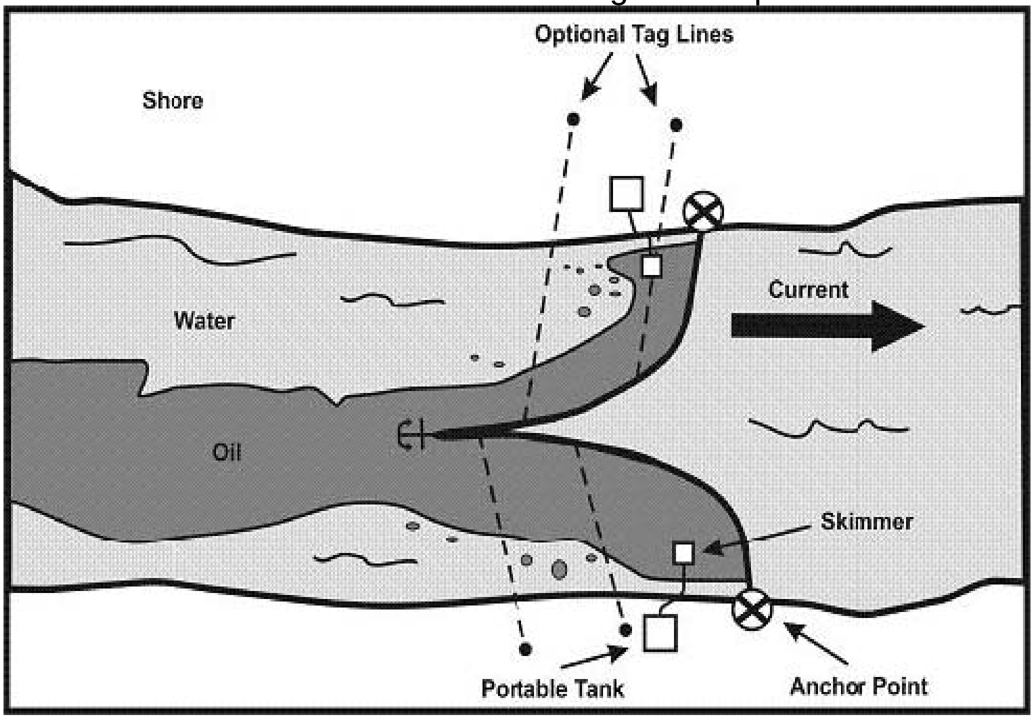


FIGURE C.7
Closed Chevron Booming Technique



ANCHOR SYSTEMS

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating environment.

Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Note that the angle relative to the current decreases rapidly as the current increases. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Single Boom

A basic diversion technique is to divert oil from a current to a recovery site along a shoreline. The recovery site is chosen where there is minimal current and a suitable recovery system can be deployed. The boom is then anchored at the site and deployed at an optimum angle to the current and secured/anchored to divert the oil to the shoreline for recovery.

C.5 SHORELINE RECOVERY

Objective & Strategy

The objective is to remove spilled oil that has been diverted to a designated recovery site accessible from the shore.

Shoreline Recovery is usually deployed as part of another tactic, such as Diversion Boom strategy. When deployed in conjunction with another tactic, fewer personnel may be required.

The general strategy is to:

1. Identify the primary recovery site.
2. Assess site conditions and access routes.
3. Determine the appropriate recovery and storage systems based on oil type, access, and deployment restrictions.
4. Mobilize and deploy equipment to recover and temporarily store the oil from the recovery site.
5. Take precautions to minimize contamination of the shoreline at the collection site.
6. Man and monitor the system as appropriate.
7. Store and transfer recovered oil and oily water according to an approved waste management plan.

Tactic Description

Shoreline recovery systems can be deployed from land access routes (beaches, all-terrain vehicles), or water access. Access to the recovery site and the oil type will influence/dictate the options of equipment to be used.

SKIMMING SYSTEMS

Shoreline recovery requires at least one portable skimming system to remove spilled oil. The typical portable skimming system includes:

- Skimmer with pump and power pack
- Hose (suction and discharge with fittings)
- Oil transfer and decanting pump(s)
- Repair kit (tools and extra parts)

There are many models of skimmers to choose from, but they all fall into three types:

- **Weir skimmers** draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. Weir skimmers can recover oil at high rates, but they can also recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant it back into the environment. Otherwise, the recovered water takes available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity.

- **Oleophilic skimmers** pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a storage device. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface. Oleophilic skimmers are a good choice where liquid storage capacity is limited.

- **Suction skimmers** use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best at sites with road access.

Primary Oil Storage Devices

Primary oil storage devices for shoreline recovery can be portable tanks, bladders, or truck-mounted tanks on the shoreline. If access is not restricted, larger systems can be used and deployed by heavy lifting equipment. If the site is accessible by road, vacuum trucks may be used for oil recovery, storage, and transport.

Recovery Location

Selection of a shoreline recovery location is critical to the success of this tactic. A recovery site should be in calm water with minimal currents. The site must have enough level ground to set up and operate a power pack and portable tanks. Sites with road access are preferred, but if not available, the site must have some other suitable access. Shelter, food and water for the response crew must also be considered in selecting a site.

C.6 ICE OPERATIONS

Objective & Strategy

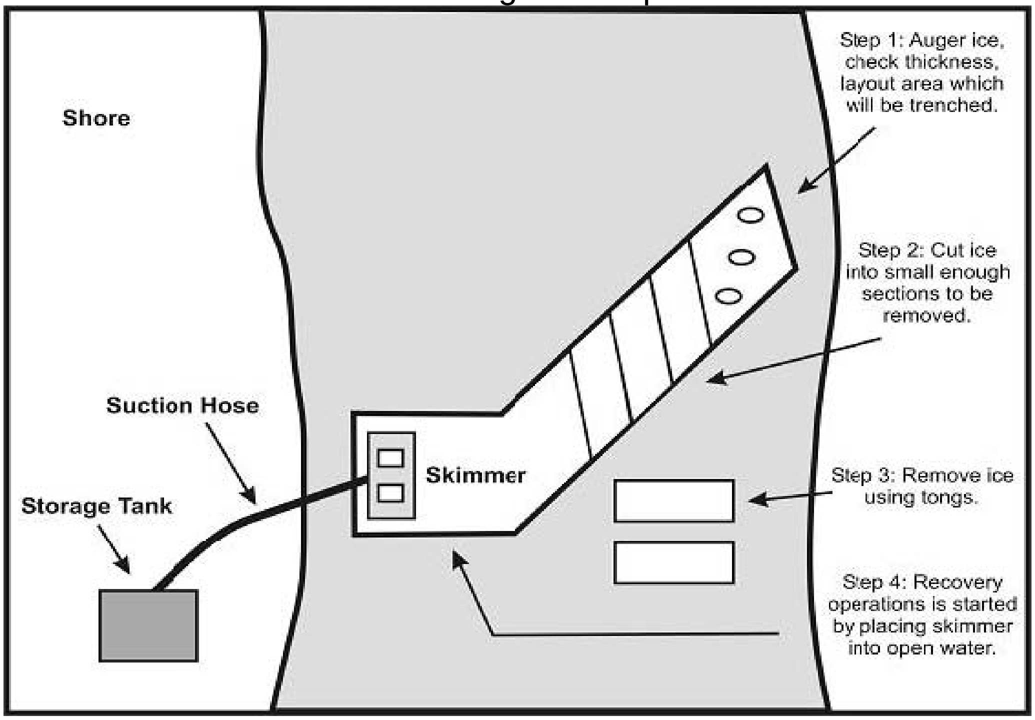
Much like that of diversion booming, the objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. With a layer of ice preventing the use of booming equipment, other response strategies must be employed.

Tactic Description

ICE SLOTTING

Ice slotting (Figure C.8) may be used in cases where the ice is thick enough to support the response equipment and personnel. Consideration for the weakening and cracking of the ice must be taken when conducting ice slotting operations. Slotting Angle The slot should be angled at approximately 30 degrees to the river's edge. The slotting needs to be wide enough to place a skimming system into the water to recover the oil. The lead end of the slot should have a slight curve which parallels the river current to allow the current to push the oil towards the recovery area.

FIGURE C.8
Ice Slotting Technique



DEFLECTION BOARDS

In place of using booming equipment it may be possible to use flat boards, such as plywood, to divert the oil under the ice into a recovery area, which has been cut out. To use this form of diversion, the depth of the water under the ice and the speed of the current ice must be considered. The angle in which the boards are placed is derived much like that of deflection booming. In any current above 3 knots, a series of cascading boards should be considered. Also, the depth of the water must be considered. The stronger the current the deeper the boards must be placed to prevent entrainment. If the water is not deep enough to place the boards to prevent entrainment, ice slotting methods may be required. Figure C.9 illustrates the overall method of using deflective boards. Figure C.10 illustrates a close up of the deflective board response method.

FIGURE C.9
Deflective Boards Recovery Strategy

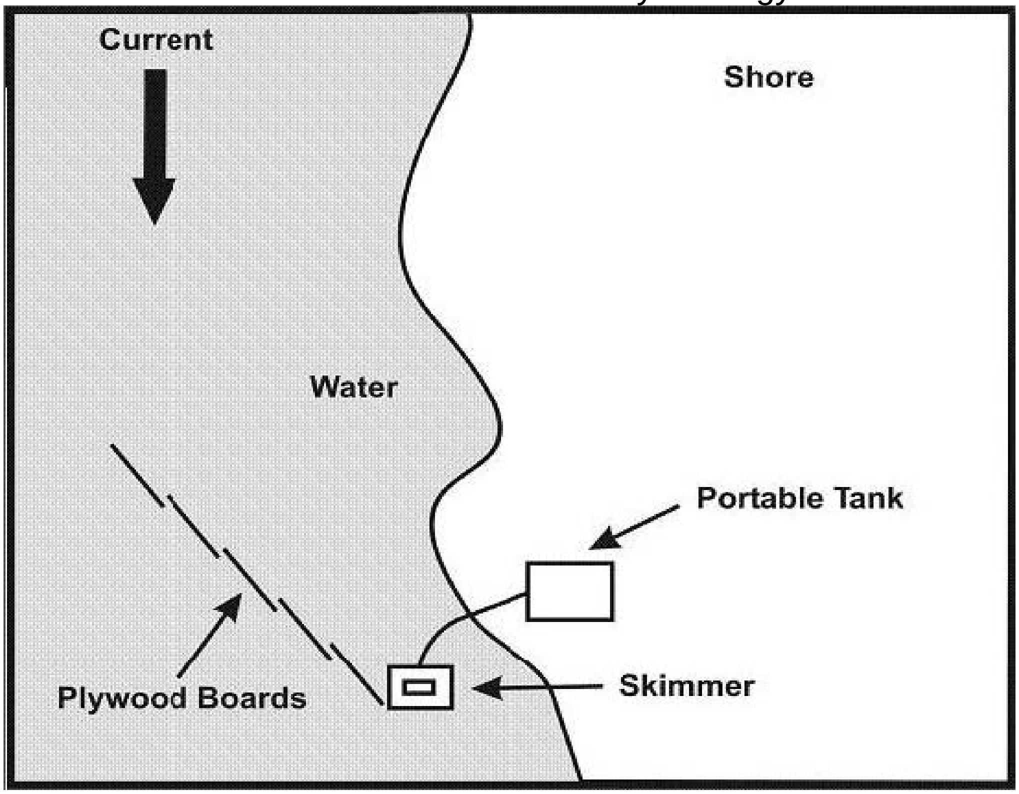
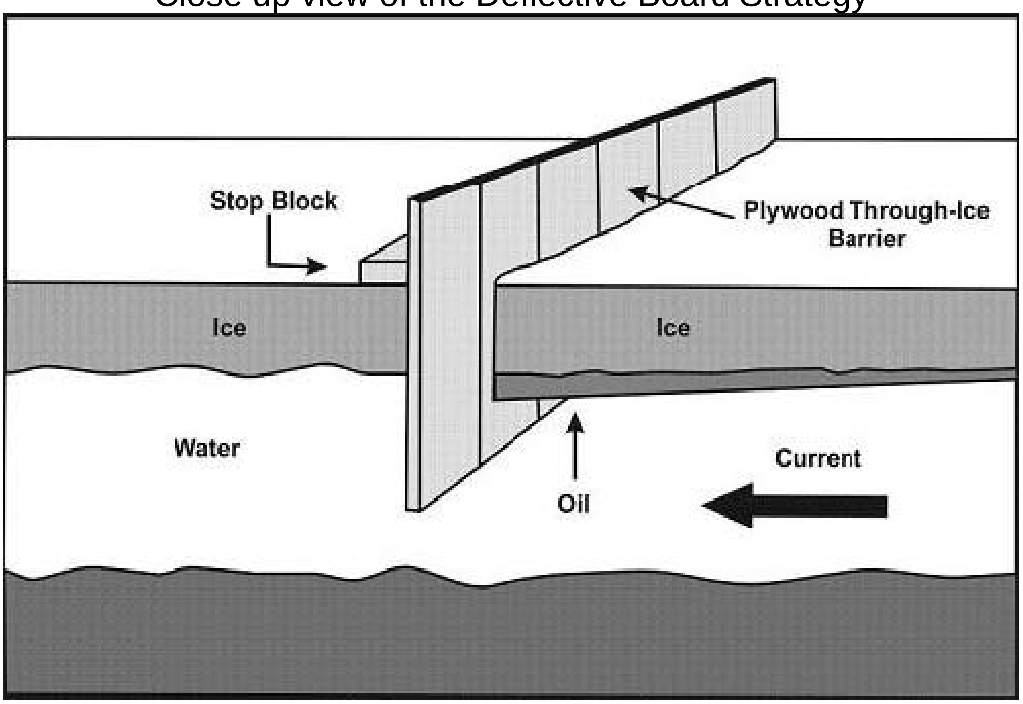


FIGURE C.10
Close up view of the Deflective Board Strategy



APPENDIX J

Basin Electric Power Cooperative
Big Bend to Witten 230-kV Transmission Project

ROUTING REPORT

December 29, 2011

-This page intentionally left blank-

Table of Contents

Table of Contents, Cont.

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 Project Description and Need

Basin Electric Power Cooperative (Basin Electric) is proposing to construct and operate a new single-circuit 230-kilovolt (kV) transmission line in south-central South Dakota that would extend from a new substation (Lower Brule Substation) south of the Big Bend Dam on Lake Sharpe approximately 74 miles south-southwest to the existing Witten Substation located south of U.S. Highway 18. In addition to the new 230-kV transmission line, Western Area Power Administration (Western) is proposing to convert an existing single-circuit 230-kV transmission line structure, located on the south side of the Big Bend Dam, to a double-circuit structure and construct approximately 2.2 miles of double-circuit 230-kV transmission line from the new structure to the new Lower Brule Substation. The approximate 76-mile Big Bend to Witten 230-kV Transmission Project (Project) consists of the aforementioned elements. The Project is located within Lyman and Tripp counties in south-central South Dakota. Figure 1-1 illustrates the Project study area.

The design characteristics for the proposed line between the new Lower Brule Substation and existing Witten Substation, including right-of-way (ROW) requirements, structure spacing and height, and assumed disturbance and clearance assumptions, are summarized in Table 1-1. These assumptions were used in the routing analysis and also were used during the initial Macro-Corridor Study referenced below. The proposed transmission structures would be steel single-poles and would be designed to support three conductors and an overhead optical ground wire. Tangent structures would be directly embedded into the soil and angle and dead-end structures would be constructed using concrete foundations. No guy wires are proposed. The design criteria for the portion of the line between the Big Bend Dam and the Lower Brule Substation are expected to be similar.

The proposed Lower Brule Substation would be located on the Lower Brule Indian Reservation on the east side of State Highway 47 and would occupy approximately 16 acres of land (Figure 2-1). The substation location would be determined via consultation with tribal representatives. The existing Witten Substation would be expanded immediately to the northeast to accommodate the new 230-kV connection. The new part of the substation would have a separate access road and would be separated by a fence from the existing Witten Substation.

The need for the Project is driven by two key factors: 1) serve proposed short-term load growth on the 115-kV system between Basin Electric's Mission and Fort Randall Substations, including electric service demands from pump stations for the proposed TransCanada Keystone XL Pipeline; and 2) provide an additional source of power at the Witten Substation to improve regional system reliability and voltage stability.

This page intentionally left blank.

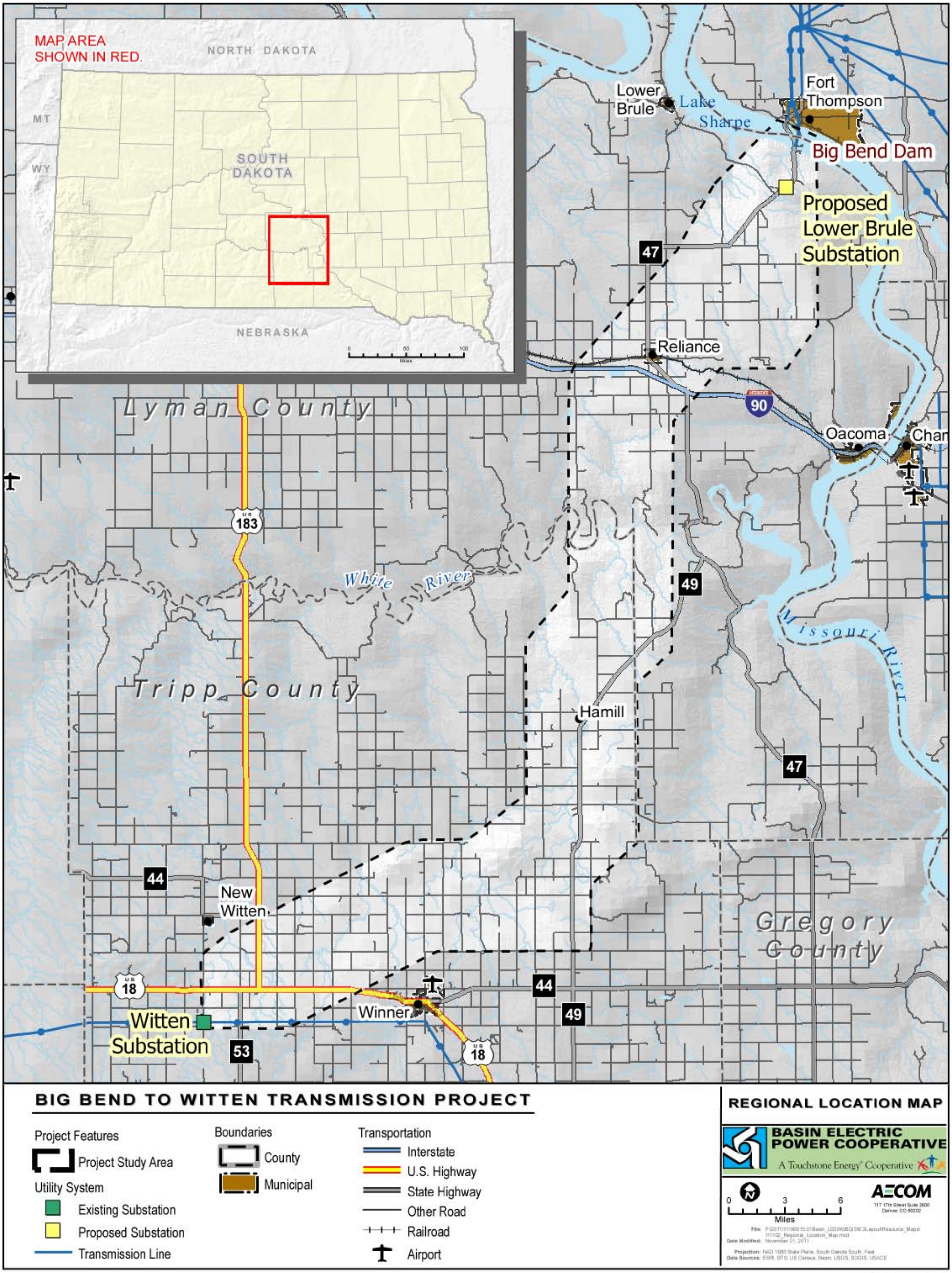

MAP AREA
SHOWN IN RED.
NORTH DAKOTA
MT
WY
SOUTH
DAKOTA
NEBRASKA
Lower
Brule
Lake
Sharpe
Fort
Thompson
Big Bend Dam
Proposed
Lower Brule
Substation
47
Reliance
90
Oacoma
Lyman County
183
White River
49
Missouri River
Tripp County
Hamill
47
44
New
Witten
Gregory
County
18
44
49
Winner
Witten
Substation
53
18
BIG BEND TO WITTEN TRANSMISSION PROJECT
Project Features
Project Study Area
Utility System
Existing Substation
Proposed Substation
Transmission Line
Boundaries
County
Municipal
Transportation
Interstate
U.S. Highway
State Highway
Other Road
Railroad
Airport
REGIONAL LOCATION MAP
BASIN ELECTRIC
POWER COOPERATIVE
A Touchstone Energy Cooperative
AECOM
0
3
6
Miles

FIGURE 1-1

This page intentionally left blank.

Table 1-1
Lower Brule-Witten Transmission Line Characteristics

Description of Design Component	Values
Voltage (kV)	230
Conductor Diameter (inches)	1.345
Right-of-Way Width (feet)	125
Typical Minimum and Maximum Span Distances Between Structures (feet)	650 - 950
Average Span (feet)	800
Minimum and Maximum Structure Height (feet)	70 - 115
Average Height of Structures (feet)	95
Average Number of Structures (per mile)	6.6
Temporary Disturbance per Structure (square feet) (approximately 125-foot x 100-foot area)	12,500
Permanent Disturbance per Structure (acre) (approximately 3-foot diameter per structure leg)	<0.0002
Minimum Conductor-to-Ground Clearance to Agricultural Land at 100 degrees Celsius (°C) (feet)	26
Minimum Conductor-to-Ground Clearance to Rural Roads at 100°C (feet)	28
Minimum Conductor-to-Ground Clearance to Paved Highways at 100°C (feet)	31
Circuit Configuration	Vertical

1.2 Purpose of the Routing Report

RUS guidance regarding NEPA implementation (RUS Bulletin 1794A-603) requires that a Macro-Corridor Study (MCS) and an Alternative Evaluation Study (AES) be prepared by the project proponent and accepted by RUS prior to the start of the official NEPA process. Basin Electric published the Big Bend to Witten 230-kV Transmission Project Alternative Evaluation and Macro-Corridor Study (hereinafter referred to as the AE/MCS; available at http://www.rurdev.usda.gov/UWP-BigBendToWitten_SD.html) in April 2011, to evaluate the system alternatives that best meet the purpose and need of the Project, as well as to identify corridors and preliminary routes for the transmission line. This Routing Report evaluates route alternatives in more detail, and identifies the final three routes that will be carried forward into the Environmental Assessment. The Routing Report identifies Basin Electric's (Applicant) Preferred Route, as well as two alternative routes.

2.0 PROJECT BACKGROUND

2.1 Definition of the Study Area

The Project study area for the Routing Report is defined in the AE/MCS. The extent of a study area for a transmission line project is primarily determined by the project endpoints, the purpose and need, and the electric system requirements and components that best meet the purpose and need. As noted previously under Project Description and Need, Basin Electric and Western determined that a new double-circuit 230-kV transmission line from the Big Bend Dam to the proposed Lower Brule Substation, and a single-circuit 230-kV transmission line from the Lower Brule Substation to the Witten Substation offered the best way to meet the purpose and need for the Project. In addition to the knowing the two project endpoints, West Central Electric Cooperative (West Central) requested a 230-kV/69-kV interconnection to the proposed transmission line approximately 10 miles southwest of the Big Bend Switchyard near the town of Reliance. The limited number of reasonable crossing locations of the White River and the need to provide an interconnection with West Central ultimately helped define the Project study area boundary. The resulting 6-mile-wide macro-corridor generally trends north-south through Lyman County and into Tripp County south of the unincorporated town of Hamill. At a point approximately 6 miles south of Hamill, the macro-corridor turns southwest to the Witten Substation. The Project study area is shown in Figure 1-1 in this report. The study area encompasses approximately 391.2 square miles.

2.2 Summary of Alternative Evaluation and Macro-Corridor Study

The AE/MCS provides additional detail regarding the Project purpose and need, as well as regional transmission system studies and analyses. That study is incorporated by reference into this Routing Report. The AE/MCS defined the study area, summarized the resource data collection, and included a constraints and opportunities analysis, defining the resource attributes that would affect routing the proposed transmission line. Resource data were gathered from local municipalities, counties, and state and federal agencies, primarily consisting of existing Geographic Information System (GIS) data bases. These data included: existing linear transportation and utility corridors; land use and jurisdiction information; cultural resources; wetlands and water resources (e.g., water bodies, floodplains); geologic hazards; and biological resources. Aerial photography was also used as a base map to verify the existing conditions within the study area, and limited field reconnaissance was conducted to ground-truth some of the desktop data. Other resources considered but not used in the AE/MCS process included soils, slope, agriculture, and oil and gas wells. These resources were not used in the opportunity and constraints analysis since the resources were either determined to be absent or nearly ubiquitous across the entire study area and therefore, would not be useful in discriminating among various routes.

The opportunities and constraints analysis was based on criteria associated with the resources previously noted. Specifically, the categories of criteria included opportunity areas, avoidance areas and exclusion areas. Opportunity areas were limited primarily to areas along existing road or utility rights-of-way (ROW), as well as rural rangeland, croplands, and open space. Avoidance areas were identified for resources that should be avoided if possible, but that could be crossed by the proposed transmission line under certain conditions (limited crossing or implementation of design measures or mitigation measures would avoid adverse effects). Exclusion areas were identified as those areas that should be excluded from transmission line crossing and include: reservoirs; strip mines; center-pivot irrigation; areas within 150 feet of occupied residences; areas within 150 feet of schools, cemeteries, parks, and recreation areas; areas within 50 feet of a Federal Communications Commission (FCC) structure; areas within 100 feet of a documented cultural resource site; and areas within 0.25 mile of active sharp-tailed grouse leks.

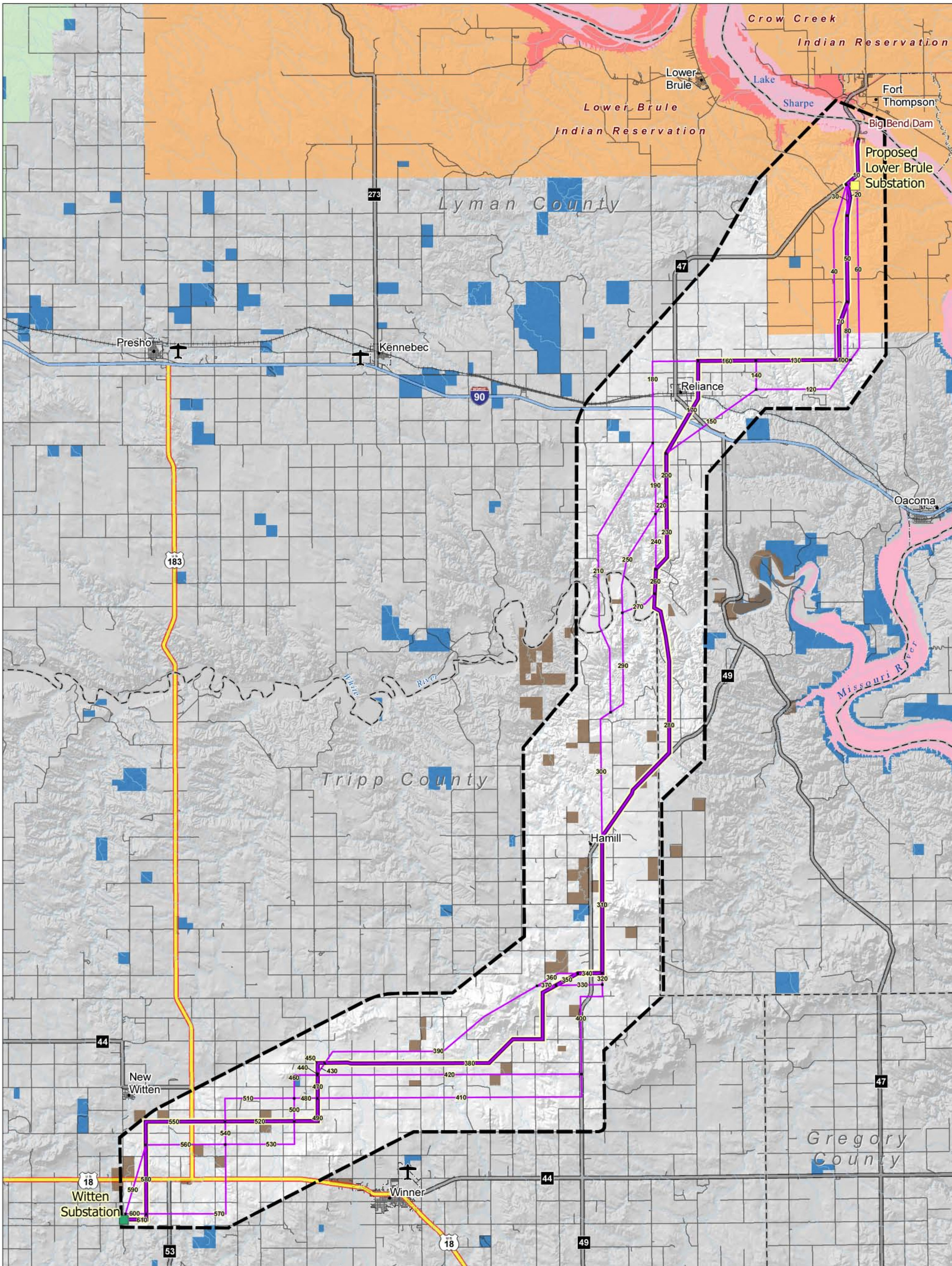
Based on the GIS database information, a composite map was produced identifying the opportunities and constraints within the macro-corridor. The opportunities and constraints information was used by Basin Electric to identify alternative routes and route segments that would potentially meet the routing objectives: connect the two substations; maximize the opportunities and minimize the constraints; and be cost-effective. In addition to gathering resource data and developing an opportunities and constraints map, the early phase of routing also included public participation, which is described further in the EA and Scoping Report. Figure 2-1 illustrates the route segments presented at the public scoping meetings, as well as the initial route proposed by Basin Electric and Western ("Applicant-Preferred Route").

2.3 Public and Agency Participation

The RUS NEPA process included pre-scoping activities, agency and tribal consultation, and public scoping meetings. The data gathered from the public and agency outreach efforts were used in the initial identification of potential routes. A detailed description of the scoping process is provided in Chapter 2 of the Big Bend to Witten 230-kV Transmission Project Environmental Assessment Scoping Report, July 2011, with a summary of scoping comments compiled in Appendix C of that document. The public scoping meetings were held within the study area on April 26 and 27, 2011. At these meetings, Basin Electric and Western provided an opportunity for the public to understand the proposed Project and the NEPA process, as well as provide their comments both verbally and in written form. A number of visual aids (e.g., poster boards) were used to graphically show the study area and the initial set of route segments developed by Basin Electric and Western. Figure 2-1 illustrates the route segments presented at the public scoping meetings, as well as the initial route proposed by Basin Electric and Western ("Applicant-Preferred Route").

Scoping comments covered a variety of topics including: agriculture, wildlife, construction/maintenance concerns, grazing, lands/realty, public health and safety, reclamation, socioeconomics, transportation and visual resources. A number of comments were also made specific to the Project purpose and need, or to a particular route segment that crossed or was in close proximity to a landowner's property.

-This page intentionally left blank-



BIG BEND TO WITTEN TRANSMISSION PROJECT

SEGMENTS PRESENTED AT PUBLIC SCOPING

Project Features
- Project Study Area
- Alternative Route Segment
- Proposed Route Presented At Scoping

Jurisdiction
- DOD - Army Corps of Engineers
- Recreation Areas
- BIA - Indian Reservation
- USFS - National Grassland
- State of South Dakota
- Indian Trust Land

Transportation
- Interstate
- U.S. Highway
- State Highway
- Other Road
- Railroad
- Airport

Boundaries
- County
- Municipal

Utility System
- Existing Substation
- Proposed Substation

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

0 2.5 5
Miles

AECOM
717 17th Street Suite 2600
Denver, CO 80202

File: P:\2011\11180015.01Basin_LB2W\06GIS\6.3Layout\Resource_Maps\111121_Public_Scoping_Segments.mxd
Date Modified: November 21, 2011

Projection: NAD 1983 State Plane, South Dakota South, Feet
Data Sources: ESRI, BTS, US Census, Basin, USGS, SDGIS, USACE

FIGURE 2-1

-This page intentionally left blank-

2.4 Adjustments to Route Segments

Based on public comments, several route segments were eliminated from the original set presented at the scoping meetings. In addition, Basin Electric made additional refinements to the Applicant-Preferred Route based on input from landowners and member cooperatives, or to avoid other types of sensitive features.

The following five route segments were eliminated based on information gathered during preparation of the AE/MCS, field reconnaissance, and public scoping meetings:

- Segment 80: This segment had multiple crossings over the North Fork American Creek.
- Segment 380: This segment had a relatively large number of residences within 500 feet of the centerline, a greater number of Class I archaeological resource sites than other segments, substantial wetlands crossings and impacts to surface waters.
- Segment 420: The segment crossed Indian Trust land, had a number of residences within 500 feet, and crossed a large number of wetlands and surface waters.
- Segment 520: Similar to Segment 420, this segment crossed Indian Trust land, had a number of residences within 500 feet, and crossed a large number of wetlands and surface waters.
- Segment 550: This segment had the greatest impact to surface waters.

Following the public scoping meetings, Basin Electric made the following adjustments to the Applicant-Preferred Route:

- Near Reliance, the original route was located south and east of Reliance and followed Segments 170, 200, and 230. The Applicant-Preferred Route was shifted to the north and west of Reliance to accommodate West Central's request for a tap site in this location and landowner concerns regarding the location of the original route.
- South of the White River, the original route followed Segment 280. The Applicant-Preferred Route was shifted 0.5 mile west to accommodate a landowner request, and the route continued south of Highway 49 for approximately 1.25 miles to avoid crossing Indian Trust land in Section 13.
- North of Winner, the original route followed Segment 380. The Applicant-Preferred Route was moved 0.5 mile north along a portion of Segment 390 to accommodate potential future development along 272nd Street and to avoid a large wetland area.
- The last 10 miles of the original route into the Witten Substation followed Segments 490, 520, 550, 580, and 610. Routing in this area was shifted to avoid farmland and to follow ½-section lines or parallel to section lines to minimize disturbance to farming activities. In addition, the route along Segment 520 was shifted 0.5 mile north to avoid Indian Trust land.

This page intentionally left blank.

3.0 ALTERNATIVE ROUTE SCREENING ANALYSIS

3.1 Overview of Alternative Route Identification

The Project consists of a series of potential routes (consisting of 63 route segments) between the Big Bend Dam, proposed Lower Brule Substation, and existing Witten Substation. The potential route segments were presented at the public scoping meetings, along with an Applicant-Preferred Route proposed by Basin Electric and Western. As noted in Section 2.3, some segments were removed from further consideration.

As part of the routing study, the remaining route segments were combined into 16 potential alternative routes. The 16 potential alternative routes were identified through an iterative process that considered all of the segments presented at the public scoping meetings, as well as constraints within the Project study area identified during the AE/MCS. The vast majority of segments presented during scoping were used in at least one of the 16 potential alternative routes or the Applicant-Preferred Route.

During the AE/MCS process and before formal public scoping, Basin Electric identified a preliminary proposed route that minimized environmental and land use constraints, and minimized project costs and engineering constraints. After public scoping , the Applicant-Preferred Route was refined in response to input from the public and West Central regarding the interconnection near Reliance. These modifications are described in Section 2.3.

To identify the routes proposed for analysis in the EA, the 16 alternative routes and the Applicant-Preferred Route were narrowed down to three routes (the Applicant-Preferred Route and two alternatives) through a screening process that included both quantitative and qualitative metrics.

The quantitative metrics include output from a computerized GIS analysis that tabulates potential constraints within the Project study area and summarizes the data in matrix format. The specific quantitative metrics (criteria) that were used and evaluated in the matrix are described in more detail in Section 3.2. The comparative matrix quantifies the potential effects for each criterion, ranks each criterion (where lowest generally is best depending on the criterion), and then tallies the rankings are to represent an overall total for a relative comparison between alternative routes. To preserve an objective analysis, the criteria were not weighted, since weighting introduces a subjective element regarding the relative importance of various criteria. For this analysis, all criteria were treated equally. The ranks for each criterion were summed to create an overall total score for each route and the overall total scores for each route were ranked to determine the overall rank of each route. In addition to the qualitative metrics described below, the overall rank was used to help identify potential alternative routes for evaluation in the EA. Table 3-1 depicts the summary matrix of quantitative data by route.

This page intentionally left blank.

Table 3-1 Comparative Matrix – 17 Alternative Routes

CATEGORY	ROUTES 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Route Length																	**Applicant-Preferred Route**
Route Length (feet)	405,000	405,326	385,713	387,603	396,939	397,265	377,651	379,542	396,959	397,285	377,672	379,562	400,754	401,080	381,467	383,357	399,714
Route Length (miles)	77	77	73	73	75	75	72	72	75	75	72	72	76	76	72	73	76
RANK (LOW BEST)	5	5	2	2	3	3	1	1	3	3	1	1	4	4	1	2	4
TOTAL SCORE	**5**	**5**	**2**	**2**	**3**	**3**	**1**	**1**	**3**	**3**	**1**	**1**	**4**	**4**	**1**	**2**	**4**
TOTAL RANK (LOW BEST)	**5**	**5**	**2**	**2**	**3**	**3**	**1**	**1**	**3**	**3**	**1**	**1**	**4**	**4**	**1**	**2**	**4**
Engineering																	
Length Within 200 feet of Existing Transmission or Distribution Lines (feet)	8,952	14,057	8,952	8,952	8,918	14,022	8,918	8,918	8,952	14,057	8,952	8,952	9,718	14,822	9,718	9,718	7,825
Length Within 200 feet of Existing U.S. and State Highways (feet)	29,402	29,402	8,798	8,798	53,269	53,269	32,665	32,665	29,013	29,013	8,409	8,409	29,008	29,008	8,404	8,404	16,144
Length within 0.25 mile of Scenic Byways (feet)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	15,000
RANK (LOW BEST)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Length within 200 feet of County Roads (feet)	36,570	36,570	29,223	29,163	47,528	47,528	40,181	40,121	26,168	26,168	18,821	18,761	44,858	44,858	37,511	37,451	66,626
Length within 200 feet of Section Lines (feet)	78,186	79,412	64,099	54,692	99,823	101,049	85,736	76,329	69,604	70,830	55,517	46,110	98,629	99,855	84,542	75,135	133,855
Total Length Adjacent All Linear Features	153,110	159,441	111,072	101,605	209,537	215,868	167,499	158,032	133,737	140,067	91,699	82,232	182,213	188,543	140,175	130,708	224,450
Total % Adjacent to Linear Features	38%	39%	29%	26%	53%	54%	44%	42%	34%	35%	24%	22%	45%	47%	37%	34%	56%
RANK (HIGH BEST)	5	5	7	7	2	2	4	4	6	5	8	8	3	3	5	6	1
TOTAL SCORE	**7**	**7**	**9**	**9**	**4**	**4**	**6**	**6**	**8**	**7**	**10**	**10**	**5**	**5**	**7**	**8**	**2**
TOTAL RANK (LOW BEST)	**5**	**5**	**7**	**7**	**2**	**2**	**4**	**4**	**6**	**5**	**8**	**8**	**3**	**3**	**5**	**6**	**1**
Jurisdiction																	
Length Crossing Indian Trust Land (feet)	0	0	0	0	7,235	7,235	7,235	7,235	0	0	0	0	0	0	0	0	2,614
RANK (LOW BEST)	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	1	2
TOTAL SCORE	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
TOTAL RANK (LOW BEST)	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
Land Use/Land Cover																	
Length Crossing Reservoirs and Strip Mines (feet)	379	379	379	379	0	0	0	0	379	379	379	379	0	0	0	0	0
RANK (LOW BEST)	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1
Communication Facilities Within 150 feet (number)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
RANK (LOW BEST)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
TOTAL SCORE	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**2**
TOTAL RANK (LOW BEST)	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**
Residential																	
Number of Residences within 250 Feet of Centerline	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0
RANK (LOW BEST)	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	1
Number of Residences between 251- 500 Feet of Centerline	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	2
RANK (LOW BEST)	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	2
TOTAL SCORE	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**
TOTAL RANK (LOW BEST)	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**
Wetlands and Water Resources																	
Number of Crossings of Perennial Streams (number)	6	6	6	6	3	3	3	3	7	7	7	7	7	7	7	7	3
RANK (LOW BEST)	2	2	2	2	1	1	1	1	3	3	3	3	3	3	3	3	1
Length within 100 ft of Perennial/Intermittent Streams (feet)	28,000	28,000	25,000	25,000	28,000	28,000	25,000	25,000	32,000	32,000	30,000	29,000	32,000	32,000	30,000	29,000	28,000
RANK (LOW BEST)	2	2	1	1	2	2	1	1	5	5	4	3	5	5	4	3	2
Length Crossing Waterbodies (feet)	1,200	1,200	1,200	1,200	1,600	1,600	1,600	1,600	1,500	1,500	1,500	1,500	1,200	1,200	1,200	1,200	1,600
RANK (LOW BEST)	1	1	1	1	3	3	3	3	2	2	2	2	1	1	1	1	3
Length Crossing NWI Wetlands (feet)	5,000	5,000	6,000	6,000	4,000	4,000	5,000	5,000	5,000	5,000	6,000	6,000	3,000	3,000	4,000	4,000	6,000
RANK (LOW BEST)	3	3	4	4	2	2	3	3	3	3	4	4	1	1	2	2	4
TOTAL SCORE	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**13**	**13**	**13**	**12**	**10**	**10**	**10**	**9**	**10**
TOTAL RANK (LOW BEST)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**5**	**5**	**5**	**4**	**3**	**3**	**3**	**2**	**3**
Cultural and Historic Resources																	
Other Class I sites within 500 feet (number)	7	7	7	7	5	5	5	5	5	5	5	5	5	5	5	5	5
RANK (LOW BEST)	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL SCORE	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
TOTAL RANK (LOW BEST)	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Biological Resources																	
Length within known prairie dog towns (feet)	1,628	1,628	1,628	1,628	260	260	260	260	1,445	1,445	1,445	1,445	260	260	260	260	1,097
Raptor Nests within 0.25 mile (number)	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	0
RANK (LOW BEST)	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	1
Sharp-tailed grouse leks within 0.25 mile (number)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
RANK (LOW BEST)	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2
TOTAL SCORE	**4**	**4**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**
TOTAL RANK (LOW BEST)	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**2**
Totals																	
OVERALL TOTAL SCORE	**34**	**34**	**32**	**32**	**29**	**29**	**28**	**28**	**35**	**34**	**34**	**33**	**30**	**30**	**28**	**29**	**27**
TOTAL RANK (LOW BEST)	**7**	**7**	**5**	**5**	**3**	**3**	**2**	**2**	**8**	**7**	**7**	**6**	**4**	**4**	**2**	**3**	**1**

-This page intentionally left blank-

In addition to the quantitative metrics depicted in Table 3-1, the following qualitative metrics were applied during selection of the three routes from the field of 17 potential alternative routes:

One of the three routes will represent the Applicant-Preferred Route.

The alternative routes should use segments that are not duplicative of segments used by the Applicant-Preferred Route to the greatest extent possible.

The alternative routes should follow direct paths between the Project endpoints and meet the Applicant's purpose and need.

1) To the extent feasible, alternative routes should avoid major constraints including residences, Indian Trust land, cultural and historical resources, and known sensitive biological resources.

3.2 Criteria Used to Evaluate Potential Routes

The following criteria were used to develop quantitative metrics to evaluate the 16 alternative routes and the Applicant-Preferred Route in a GIS-based model and output matrix. During the analysis process, some of these criteria were subsequently removed from the comparative ranking matrix if the data were equal for all routes (no discernable difference), or if the criteria no longer applied. Criteria removed are summarized in Section 3.3.

Route Length

Route length is a key criterion that is commonly used to compare transmission line routes. Longer transmission line routes are typically (but not always) more costly to construct and may have greater impacts when compared with shorter routes.

Percent of Route Adjacent to Existing Linear Features

Routing transmission lines along existing linear features such as roads and transmission lines can reduce the potential impact when compared with constructing a "greenfield" transmission line. In many instances, existing roadways or other types of ROW can provide access to the new transmission line for both construction and maintenance purposes. For the purposes of the routing study, the following criteria were included in the linear features category:

- Transmission and distribution lines;
- U.S. and State highways;
- County roads; and
- Section lines.

The length within 200 feet of each of these features was added together and divided by the total length of the route to create a percentage adjacent to linear features.

Length Crossing Indian Trust Land

Indian Trust lands often have multiple owners, which can greatly complicate the process for obtaining easements. Consequently, parcels of Indian Trust land were identified as avoidance areas for this routing study.

Length Crossing Reservoirs and Strip Mines

Due to their typical size and breadth, or operational constraints, transmission lines are typically routed around these types of facilities. In some cases, reservoirs can be spanned if necessary.

Communication Facilities within 150 Feet

Transmission line routing must meet the requirements of the Federal Communications Commission (FCC) to avoid potential interference with AM radio, FM radio and telecommunications facilities.

Residences within 500 Feet

Land use compatibility issues must be considered when routing a transmission line in proximity to residences. A typical transmission line routing criterion looks at residences within the proposed ROW and within an additional reasonable buffer zone outside the ROW. The proposed ROW is 125 feet (62.5 feet on either side of the transmission line centerline) and no residences were found within the proposed ROW. The number of residences within 500 feet of each route was included in the matrix.

Number of Crossings of Perennial Streams

All of the streams within the Project study area can be spanned, but limiting the number of stream crossings can reduce direct and indirect effects to water quality and associated stream habitat, and, depending on the length of the stream crossing, can reduce construction costs.

Length within 100 feet of Perennial/Intermittent Streams

Construction and long-term maintenance of utility lines and structures can result in direct and indirect effects to surface waters as a result of soil disturbance, erosion and habitat disturbance. Maintaining an adequate buffer between transmission line construction activities and adjacent surface waters is prudent.

Length Crossing Waterbodies

Large waterbodies can pose obstacles to transmission line routing, and sometimes require routing around the water feature. The Project would be constructed using 230-kV transmission structures that allow for an average span length of 650 to 950 feet. Waterbodies that are less than 950 feet wide could be spanned by the proposed transmission line.

Length Crossing National Wetland Inventory (NWI) Wetlands

Due to the sensitive nature of wetland habitat and the species occupying the habitat, direct impacts as a result of short-term construction or long-term operations should be avoided. Wetlands can typically be spanned by transmission lines; however, wetlands within the ROW would need to be delineated in localized areas prior to construction and measures to avoid impacts to wetlands would be implemented.

Class I Cultural Resources Sites within 500 Feet

Important historical and cultural resources should be avoided when routing a transmission line. Depending on the resource and its status with the State Historic Preservation Office, some sites can be spanned as long as the ground surface in the vicinity of the site is not disturbed.

Length within Known Prairie Dog Colonies

Prairie dog colonies can be a potential concern for routing transmission lines since these colonies typically provide habitat for the black-footed ferret, which is a federally-listed endangered species. Project biologists have determined that it is highly unlikely the black-footed ferret would occur in the Project study area, and RUS has concurred with this determination. Another potential concern is that burrowing owls often use prairie dog burrows for nest sites. The burrowing owl is protected under the Migratory Bird Treaty Act. Burrowing owl surveys within potential habitat areas would be conducted prior to construction.

Raptor Nests within 0.25 mile of Centerline

Transmission line routing must consider potential effects to raptors and other avian species protected by the Migratory Bird Treaty Act. Areas of high flight activity are generally found around nests and foraging areas. Proximity of nests to transmission lines increases the risk of collision and potential mortality.

Length within Sharp-Tailed Grouse Leks

Sharp-tailed grouse leks were included in the constraints criteria since the grouse population has been in decline through loss of habitat across the nation. The grouse prefers grasslands and prairies and primarily forages on the ground in summer months. Nesting typically occurs in May and June. The presence of active leks (i.e. communal display and breeding areas) along a transmission line route may influence construction scheduling, but these leks can typically be spanned by the transmission line with no long-term effects.

3.3 Criteria Considered but Removed from Comparative Analysis

Several routing criteria were evaluated against the data compiled during the AE/MCS data search but were ultimately removed from further evaluation in the comparative analysis matrix because they either did not apply to the alternative routes or the criteria applied evenly to all routes and therefore, would not make a discernable difference for purposes of comparing and ranking alternatives. These criteria were removed from the comparative analysis.

Length within 0.25 mile of a Scenic Byway

Transmission lines and associated structures could result in an adverse visual effect to motorists traveling on scenic byways. Altering a scenic viewshed by erecting man-made utility infrastructure could detract from the overall viewing experience. All of the routes evaluated parallel a scenic byway (Native American Scenic Byway) for approximately 3 miles between Big Bend Dam and the proposed Lower Brule Substation, so this criterion was not particularly useful in distinguishing among the various alternative routes; however, the Applicant-Preferred Route parallels scenic byways for a slightly shorter length than any of the alternative routes. As a result, this criterion was removed from the comparative matrix.

Length within 500 Feet of Census Landmarks

Census landmarks consist of structures accounted for in census data and typically include schools, hospitals, airports and landing strips, churches, cemeteries and jails. These types of land uses may present routing constraints depending upon the distance between the transmission line and the census landmark structure and the sensitivity of the land use. Other factors include the size of the transmission line (kV) and associated structure specifications. No census landmarks were identified within 500 feet of the centerline of alternative routes, with the exception of an old, inactive landing strip. As a result, this criterion was removed from the matrix.

Length within Areas Classified as Important Farmland

Based on U.S. Department of Agriculture classifications, important farmland within the macro-corridor is classified as "prime farmland", "farmland of statewide importance", or "prime farmland, if irrigated." Because of the extensive distribution of important farmland throughout the macro-corridor, all of the routes would cross varying amounts of important farmland. Since important farmland is widely distributed throughout the macro-corridor, this category was not a significant discriminator among the routes and was therefore removed from the matrix.

Construction of transmission lines through agricultural areas rarely results in a disruption of agricultural practices for more than a single growing season, and if constructed after harvest or during winter months, may result in minimal disruption. In addition, most agricultural operations may continue within the ROW once construction has been completed so the amount of land removed from agricultural production is minimal and is generally limited to the actual footprint of the transmission structures and the area immediately around the structures.

Historic Structures

Only one historic structure was identified during the early stages of the AE/MCS, within 500 feet of an early version of the Applicant-Preferred Route. The Applicant-Preferred Route was subsequently shifted away from the structure. For this reason, this criterion was removed from the matrix.

3.4 Selection of Alternate Routes

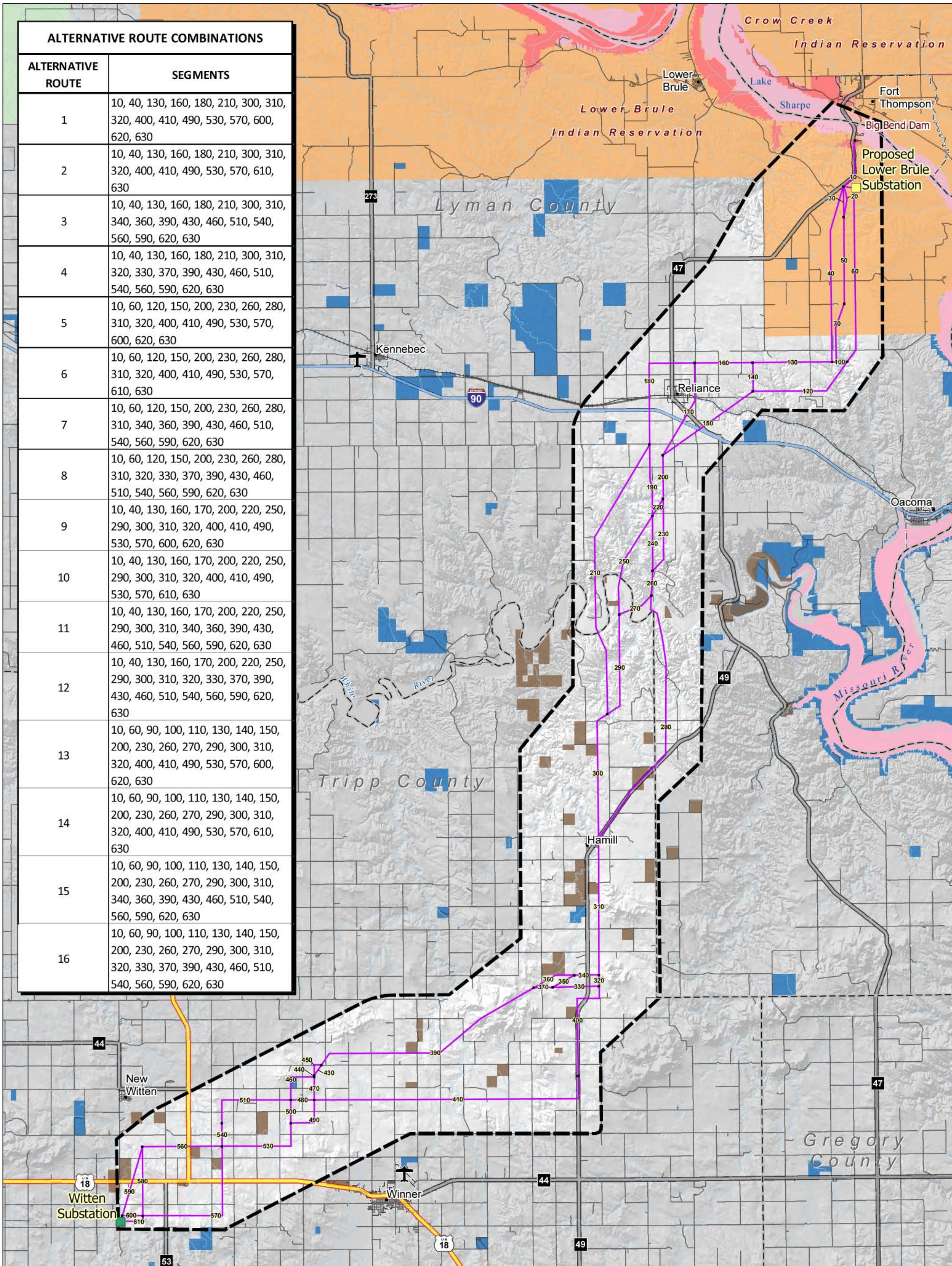
3.4.1 Big Bend – Lower Brule Substation 230-kV Transmission Line

As shown in Figures 3-1 and 3-2, the northern portion of the Project, the proposed 230-kV transmission line between the Big Bend Dam (new 230-kV double-circuit structure) and the proposed Lower Brule Substation consists of a single route, with no alternatives. This part of the Project is located entirely on the Lower Brule Indian Reservation. Basin Electric and Western will work with the Lower Brule and Rosebud Tribal Representatives to determine an appropriate alignment for the new transmission line and location for the proposed substation.

3.4.2 Lower Brule – Witten 230-kV Transmission Line

A total of 17 routes including the Applicant-Preferred Route (identified as Route 17) were evaluated in the comparative matrix. The 16 preliminary alternative routes consist of a combination of various segments. Figure 3-1 depicts the segments that were evaluated in this routing report and includes a table that defines the segment combinations that comprised each of the 16 alternative routes. Figure 3-2 is a map that shows the Applicant-Preferred Route. As noted previously, a number of adjustments were made to the Applicant-Preferred Route between public scoping and the comparative analysis/routing report phase in order to avoid conflicts, minimize environmental effects, and/or address the concerns of the greatest number of landowners.

ALTERNATIVE ROUTE COMBINATIONS	
ALTERNATIVE ROUTE	SEGMENTS
1	10, 40, 130, 160, 180, 210, 300, 310, 320, 400, 410, 490, 530, 570, 600, 620, 630
2	10, 40, 130, 160, 180, 210, 300, 310, 320, 400, 410, 490, 530, 570, 610, 630
3	10, 40, 130, 160, 180, 210, 300, 310, 340, 360, 390, 430, 460, 510, 540, 560, 590, 620, 630
4	10, 40, 130, 160, 180, 210, 300, 310, 320, 330, 370, 390, 430, 460, 510, 540, 560, 590, 620, 630
5	10, 60, 120, 150, 200, 230, 260, 280, 310, 320, 400, 410, 490, 530, 570, 600, 620, 630
6	10, 60, 120, 150, 200, 230, 260, 280, 310, 320, 400, 410, 490, 530, 570, 610, 630
7	10, 60, 120, 150, 200, 230, 260, 280, 310, 340, 360, 390, 430, 460, 510, 540, 560, 590, 620, 630
8	10, 60, 120, 150, 200, 230, 260, 280, 310, 320, 330, 370, 390, 430, 460, 510, 540, 560, 590, 620, 630
9	10, 40, 130, 160, 170, 200, 220, 250, 290, 300, 310, 320, 400, 410, 490, 530, 570, 600, 620, 630
10	10, 40, 130, 160, 170, 200, 220, 250, 290, 300, 310, 320, 400, 410, 490, 530, 570, 610, 630
11	10, 40, 130, 160, 170, 200, 220, 250, 290, 300, 310, 340, 360, 390, 430, 460, 510, 540, 560, 590, 620, 630
12	10, 40, 130, 160, 170, 200, 220, 250, 290, 300, 310, 320, 330, 370, 390, 430, 460, 510, 540, 560, 590, 620, 630
13	10, 60, 90, 100, 110, 130, 140, 150, 200, 230, 260, 270, 290, 300, 310, 320, 400, 410, 490, 530, 570, 600, 620, 630
14	10, 60, 90, 100, 110, 130, 140, 150, 200, 230, 260, 270, 290, 300, 310, 320, 400, 410, 490, 530, 570, 610, 630
15	10, 60, 90, 100, 110, 130, 140, 150, 200, 230, 260, 270, 290, 300, 310, 340, 360, 390, 430, 460, 510, 540, 560, 590, 620, 630
16	10, 60, 90, 100, 110, 130, 140, 150, 200, 230, 260, 270, 290, 300, 310, 320, 330, 370, 390, 430, 460, 510, 540, 560, 590, 620, 630



BIG BEND TO WITTEN TRANSMISSION PROJECT

ALTERNATIVE ROUTES

Project Features
- Project Study Area
- Alternative Route Segment

Jurisdiction
- DOD - Army Corps of Engineers
- Recreation Areas
- BIA - Indian Reservation
- USFS - National Grassland
- State of South Dakota
- Indian Trust Land

Transportation
- Interstate
- U.S. Highway
- State Highway
- Other Road
- Railroad
- Airport

Boundaries
- County
- Municipal

Utility System
- Existing Substation
- Proposed Substation

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

AECOM
717 17th Street Suite 2600
Denver, CO 80202

0 3 6
Miles

File: P:\2011\11180015.01Basin_LB2W\06GIS\6.3Layout\Resource_Maps\111121_Alternative_Routes.mxd
Date Modified: November 21, 2011

Projection: NAD 1983 State Plane, South Dakota South, Feet
Data Sources: ESRI, BTS, US Census, Basin, USGS, SDGIS, USACE

FIGURE 3-1

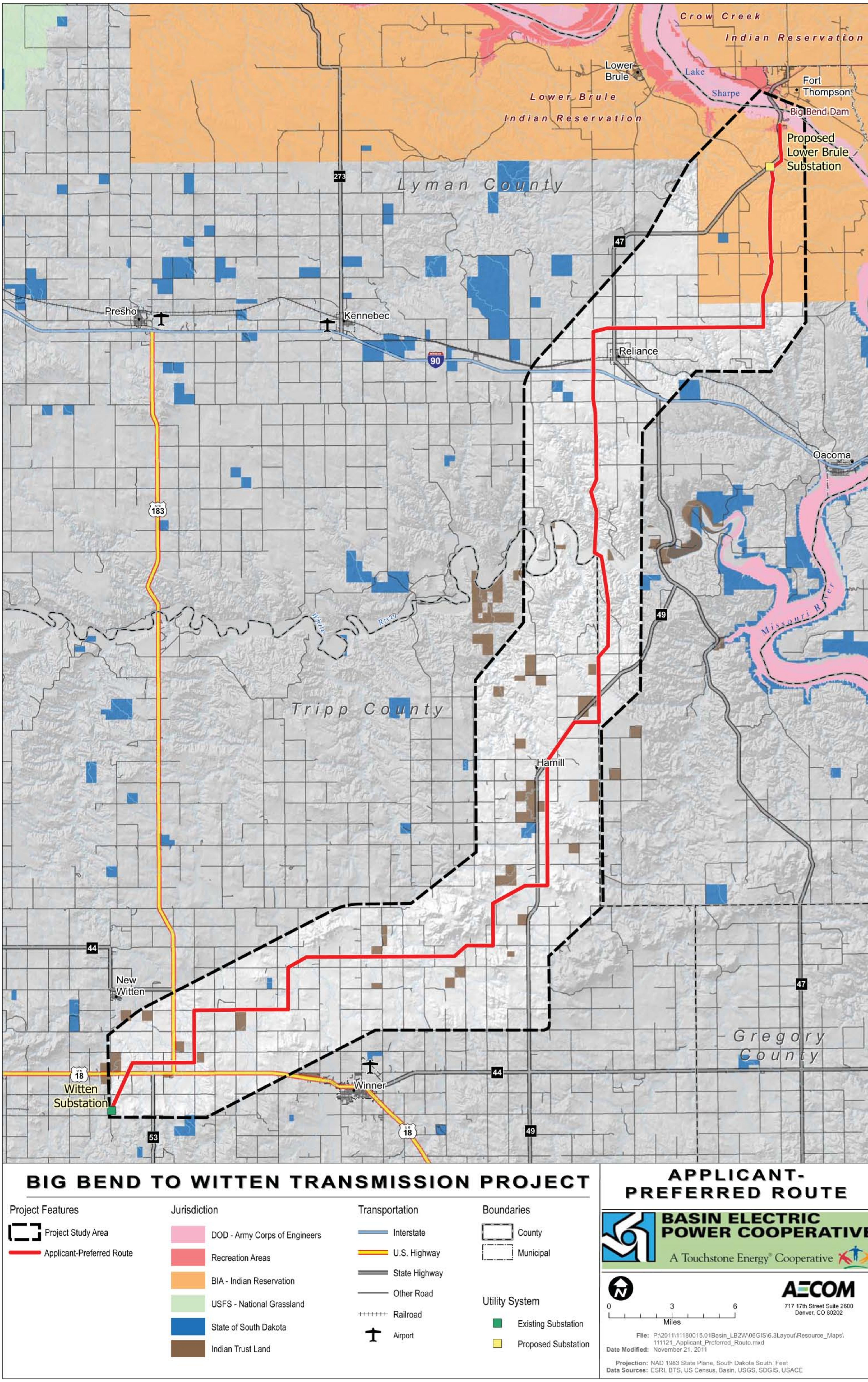

Crow Creek
Indian Reservation
Lower Brule
Lake
Sharpe
Fort Thompson
Big Bend Dam
Lower Brule
Indian Reservation
Proposed Lower Brule Substation
Lyman County
273
47
Presho
Kennebec
Reliance
90
Oacoma
183
White River
Missouri River
49
Tripp County
Hamill
44
New Witten
18
Witten Substation
Winner
53
47
Gregory County
BIG BEND TO WITTEN TRANSMISSION PROJECT
APPLICANT-PREFERRED ROUTE
Project Features
Project Study Area
Applicant-Preferred Route
Jurisdiction
DOD - Army Corps of Engineers
Recreation Areas
BIA - Indian Reservation
USFS - National Grassland
State of South Dakota
Indian Trust Land
Transportation
Interstate
U.S. Highway
State Highway
Other Road
Railroad
Airport
Boundaries
County
Municipal
Utility System
Existing Substation
Proposed Substation
BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative
AECOM
717 17th Street Suite 2600
Denver, CO 80202
0 3 6
Miles
File: P:\2011\11180015.01Basin_LB2W\06GIS\6.3Layout\Resource_Maps\111121_Applicant_Preferred_Route.mxd
Date Modified: November 21, 2011
Projection: NAD 1983 State Plane, South Dakota South, Feet
Data Sources: ESRI, BTS, US Census, Basin, USGS, SDGIS, USACE

FIGURE 3-2

3.4.3 Comparative Analysis of 17 Routes (Applicant-Preferred Route and 16 Alternative Routes)

Table 3-1 quantifies the resource data by alternative route and ranks the various routes based on the quantified data. With the exception of Engineering, lower values for each criterion (e.g., route length) result in a better ranking. For Engineering, the higher the quantitative data (e.g., length adjacent to linear features), the better the ranking since it is optimal to follow existing linear features when routing a transmission line.

As expected, many routes resulted in duplicate ranks for individual categories, as well as total scores and the spread between the various alternatives in the “Overall Total Score” row is considered minimal (totals ranging from 27 to 34), which emphasizes the fact that the Applicant-Preferred Route and the 16 alternative routes would result in similar impacts on the resources present within the corridor.

The following text provides a summary description of the results in Table 3-1. The values for each of these criteria allow the alternatives to be compared against each other and to see the relative differences among the alternatives.

3.4.3.1 Route Length

The 16 routes that were evaluated in the GIS model ranged in length from approximately 72 to 77 miles. Routes 7, 8, 11, 12 and 15 were all the shortest at approximately 72 miles. Routes 1 and 2 ranked 5th and were the longest at 77 miles. The Applicant-Preferred Route ranked 4th at 76 miles.

3.4.3.2 Percent of Route Adjacent to Existing Linear Features

The length of an alternative route within 200 feet of each category (transmission and distribution lines, U.S. and State Highways, county roads, and section lines) was added together and divided by the total length of the route to create a percentage adjacent to linear features. For the routes that were evaluated, the percent adjacent to existing linear features ranged from approximately 22 percent (Route 12) to 56 percent (Applicant-Preferred Route, 17). Due to the substantive difference between the routes, the percent adjacent to linear features were assigned ranks based on the range of percentages listed below:

Adjacent to Existing Linear Features (Percent Ranges)	Assigned Rank
55% to 59%	1
50% to 54%	2
45% to 49%	3
40% to 44%	4
35% to 39%	5
30% to 34%	6
25% to 29%	7
20% to 24%	8
19% or less	9

3.4.3.3 Length of Route Crossing Indian Trust Land

Routes 5, 6, 7 and 8 cross approximately 7,235 feet of Indian Trust land. In addition, the Applicant-Preferred Route crosses approximately 2,614 feet of Indian Trust land. The current alignment of the Applicant-Preferred Route barely encroaches onto a parcel of Indian Trust land (the reference line is located approximately 1 foot inside the parcel); however, Basin Electric intends to avoid this parcel of land completely during the ROW acquisition process.

3.4.3.4 Length Crossing Reservoirs and Strip Mines

Based on the GIS data from the U.S. Census Bureau, eight of the 16 alternative routes would cross a feature identified in the Census dataset as a reservoir. The Applicant-Preferred Route does not cross any reservoirs. Based on the size of and the length across the reservoir (379 feet), this feature could be easily spanned or avoided entirely through minor route adjustments.

3.4.3.5 Communication Facilities within 150 Feet

All 16 alternative routes are located within 150 feet of an existing telecommunications facility. The Applicant-Preferred Route does not have any telecommunications facilities within 150 feet of the current alignment.

3.4.3.6 Residences within 500 Feet

As described in the AE/MCS, there are numerous residences scattered throughout the Project corridor. Of the 16 routes that were evaluated, all of the routes have at least one and a maximum of two homes within 500 feet of the transmission line, and 12 of the alternative routes have one residence within 250 feet of centerline. Based on the centerline used in this analysis, the Applicant-Preferred Route had 2 residences within 500 feet and no residences within 250 feet.

3.4.3.7 Number of Perennial Stream Crossings

All 17 routes cross three or more perennial streams. The Applicant-Preferred Route and Alternative Routes 5, 6, 7, and 8 cross a total of 3 streams, Alternative Routes 1, 2, 3, and 4 cross 6 streams each, and Alternative Routes 9 through 16 cross 7 streams each. Stream crossings within the study area are relatively narrow and can be easily spanned by the proposed transmission line, which has a span length between 650 and 950 feet. Construction and long-term operational measures would need to be implemented to minimize impacts to water quality and stream habitat. The Applicant-Preferred Route and Alternative Routes 5, 6, 7, and 8 would have the least potential impact on water resources and therefore, ranked best for this category.

3.4.3.8 Length within 100 feet of Perennial or Intermittent Streams

All 17 routes are located within 100 feet of perennial and intermittent streams, with cumulative paralleling distances ranging between 25,000 and 32,000 feet. Alternative Routes 3, 4, 7, and 8 had the shortest distance of transmission line within 100 feet of a perennial or intermittent stream and therefore ranked the best. The Applicant-Preferred Route, along with Alternative Routes 1, 2, 5, and 6 were ranked in second place with cumulative distances of 28,000 feet.

3.4.3.9 Length Crossing Waterbodies

All of the alternative routes, as well as the Applicant-Preferred Route, cross areas defined as waterbodies or open water. The cumulative total length of crossings over waterbodies ranged from 1,200 to 1,600 feet. The Applicant-Preferred Route crosses approximately 1,600 feet in total. However, it should be noted the waterbodies crossed by any of the alternative routes can be easily spanned by the transmission line since the maximum water body width (White River crossing) is 570 feet and the typical span distance of the transmission line is 650 to 950 feet.

3.4.3.10 Length Crossing National Wetlands Inventory (NWI) Wetlands

There are numerous wetlands located within the Project study area and the total length of wetland crossings for the routes ranged from approximately 3,000 to 6,000 feet. Most of these wetland areas crossed by routes are small and can be easily spanned. One of the larger wetland areas (approximately 1,100 feet at its widest point) is crossed by the Applicant-Preferred Route, but the centerline is near the southern edge of the wetland and the ROW is expected to be shifted south to avoid or span the wetland area. All wetlands within the transmission line ROW would need to be delineated to avoid impacts during construction and maintenance activities.

3.4.3.11 Class I Cultural Resources Sites within 500 Feet

Each of the alternative routes, including the Applicant-Preferred Route, are within 500 feet of 5 to 7 previously identified cultural resources sites. The specific nature of these sites, the potential impacts of the Project, and potential avoidance/mitigation measures for these cultural resources sites will be addressed in the EA. In addition, all of the alternative routes (excluding the Applicant-Preferred Route) cross one recorded site, which has been determined to be potentially eligible for listing in the National Register of Historic Places (NHRP). Alternative Routes 1, 2, 3, and 4 and the Applicant-Preferred Route cross a second site that is listed as NRHP-eligible. Further analysis of all sites within 500 feet of the Project centerline will be required during the EA process and consultation with the South Dakota SHPO will determine potential effects and mitigation requirements. In most cases, cultural resources can be avoided by spanning the site or through protective measures implemented during construction. In some cases, the transmission line may need to be relocated or the artifacts could be recovered and preserved.

3.4.3.12 Length within Known Prairie Dog Colonies

All of the alternative routes traverse portions of previously documented prairie dog colonies, which may or may not currently be active. Prairie dog colonies are a potential concern since these colonies can provide nesting habitat for the burrowing owl, which is protected under the Migratory Bird Treaty Act. The length of the routes through prairie dog colonies ranged from 260 to 1,628 feet. The Applicant-Preferred Route would cross 1,097 feet of prairie dog colonies.

3.4.3.13 Raptor Nests within 0.25 mile of Centerline

While detailed nest surveys have not yet been completed, existing resource data compiled for this study indicate recorded raptor nests within 0.25 mile from some of the alternative routes. Alternative Routes 1, 2, 5, 6, 9, 10, 13, and 14 are all within 0.25 mile of one recorded raptor nest. All remaining routes, including the Applicant-Preferred Route, were not located in proximity to a recorded nest site and therefore, received a better ranking for this criterion.

3.4.3.14 Length within Sharp-Tailed Grouse Leks

There is one historic sharp-tailed grouse lek that has been identified within the Project study area. This historic grouse lek, which is located northwest of Reliance, would be crossed by alternative routes 1, 2, 3 and 4 and the Applicant-Preferred Route; however, the current status of this grouse lek is unknown. If this sharp-tailed grouse lek is determined to be active, construction of the transmission line may need to occur outside of the breeding season or the transmission line may need to be re-routed to avoid impacts to this sensitive species habitat.

3.4.4 Alternative Routes Removed From Further Consideration

As a result of the comparative analysis described in Section 3.3, including the quantitative data in Table 3-1, and consideration of the qualitative metrics described in Section 3.1, a number of the potential alternative routes were eliminated from further consideration. As listed in Table 3-1, the Applicant-Preferred Route ranked number 1 in comparison to all the other alternatives with a total score of 27. Several alternatives ranked in second and third place (Alternative Routes 5, 6, 7, 8, 15 and 16), with total scores of 28 and 29. The minimal spread in scores between the alternative routes is due to the fact that the difference between these routes is fairly minimal. As discussed previously, both quantitative and qualitative metrics were used to determine which routes should be eliminated. A summary of the rationale used to eliminate 14 of the alternative routes from further analysis is provided below:

- Routes 1 and 2 were eliminated since they had the greatest length of any alternative and both of these alternative routes scored poorly in the matrix.
- Routes 3 and 4 were very similar to each other. These alternative routes were eliminated based on length within known prairie dog towns and length crossing NWI wetlands.
- Routes 5, 6, 7 and 8 were eliminated since they used segments that crossed Indian Trust land.
- Route 9 was eliminated due to length within known prairie dog towns and because it had the highest length within 100 feet of perennial streams. This alternative route had the worst overall score in the matrix.
- Routes 11 and 12 were very similar to each other. Those alternatives were eliminated based on length within known prairie dog towns and length crossing NWI wetlands.
- Routes 13 and 14 were also similar to each other. These routes were the second longest routes at 76 miles each and had the greatest length within 100 feet of perennial streams.

- Route 15 is similar to Route 16, but Route 15 had a longer length within 100 feet of perennial streams.

Alternative Route 16 had minimal constraints, scored well in the matrix (total rank of 3), and shared few segments with the Applicant-Preferred Route. Therefore, Alternative Route 16 was determined to provide a reasonable alternative to the Applicant-Preferred Route. Other routes that ranked in second or third place were nearly identical to the Applicant-Preferred Route or to Alternative Route 16 and therefore, did not represent reasonable additional alternatives. Although Alternative Route 10 does not perform well in the matrix when compared with the other alternative routes (Route 10 received a total score of 34 with a rank of 7 in Table 3-1), this route was retained for evaluation in the EA since the route provides a distinctly different alternative route than either the Applicant-Preferred Route or Alternative Route 16. Additional features of the Alternative Routes and the Applicant-Preferred Route are described in Section 4.0 below.

4.0 IDENTIFICATION OF ROUTES FOR ANALYSIS IN THE EA

As described in Section 3.1, both quantitative and qualitative criteria were used to evaluate the 16 alternative routes and the Applicant-Preferred Route and to identify two alternative routes for analysis in the EA. Basin Electric and Western worked closely with RUS, Native American tribal representatives, the U.S. Army Corps of Engineers, and local landowners to identify potential routes that would best meet the Project objectives and purpose and need, while minimizing adverse environmental effects and conflicts with existing land uses. This process resulted in the identification of the Applicant-Preferred Route, which will be evaluated in detail in the EA. Basin Electric will continue to refine this route such that some potential impacts can be minimized or avoided long before construction occurs. In comparison, no comparable route refinement process has been conducted for the alternative routes.

In addition to the Applicant-Preferred Route, two alternative routes were identified based on the route screening analysis described in Section 3. This quantitative and qualitative process resulted in the identification of Alternative Routes 10 and 16. The selected routes represent a reasonable range of alternative routes within the Project study area and these routes will be evaluated in the EA. Figure 4-1 illustrates the three selected alternative routes.

4.1 Alternative Route 10

As illustrated in Table 3-1, the following features of Alternative Route 10 are favorable:

- Route 10 is slightly shorter than the Applicant-Preferred Route.
- Route 10 has a shorter length across waterbodies when compared with Applicant-Preferred Route.

Potentially unfavorable aspects of Alternative Route 10 include:

- Only 35 percent of the total length of Route 10 is adjacent to existing linear features.
- Route 10 crosses an existing reservoir.
- Route 10 crosses 7 perennial streams and has the longest length within 100 feet of perennial and intermittent streams.
- Route 10 has the second longest length within known prairie dog towns.

4.2 Alternative Route 16

As illustrated in Table 3-1, the following features of Alternative Route 16 are favorable:

- Route 16 is approximately 2 miles shorter than Route 10 and approximately 3 miles shorter than the Applicant-Preferred Route.
- Route 16 has the shortest length crossing waterbodies and NWI wetlands.

- Route 16 has the shortest length within previously documented prairie dog colonies.

Potentially unfavorable aspects of Alternative Route 16 include:

- Only 37 percent of the total length of Route 16 is adjacent to existing linear features.
- Route 16 crosses 7 perennial streams.
- Route 16 has a longer length within 100 feet of perennial and intermittent streams when compared with the Applicant-Preferred Route.

4.3 Applicant-Preferred Route

Favorable aspects of the Applicant-Preferred Route compared with the two alternative routes include:

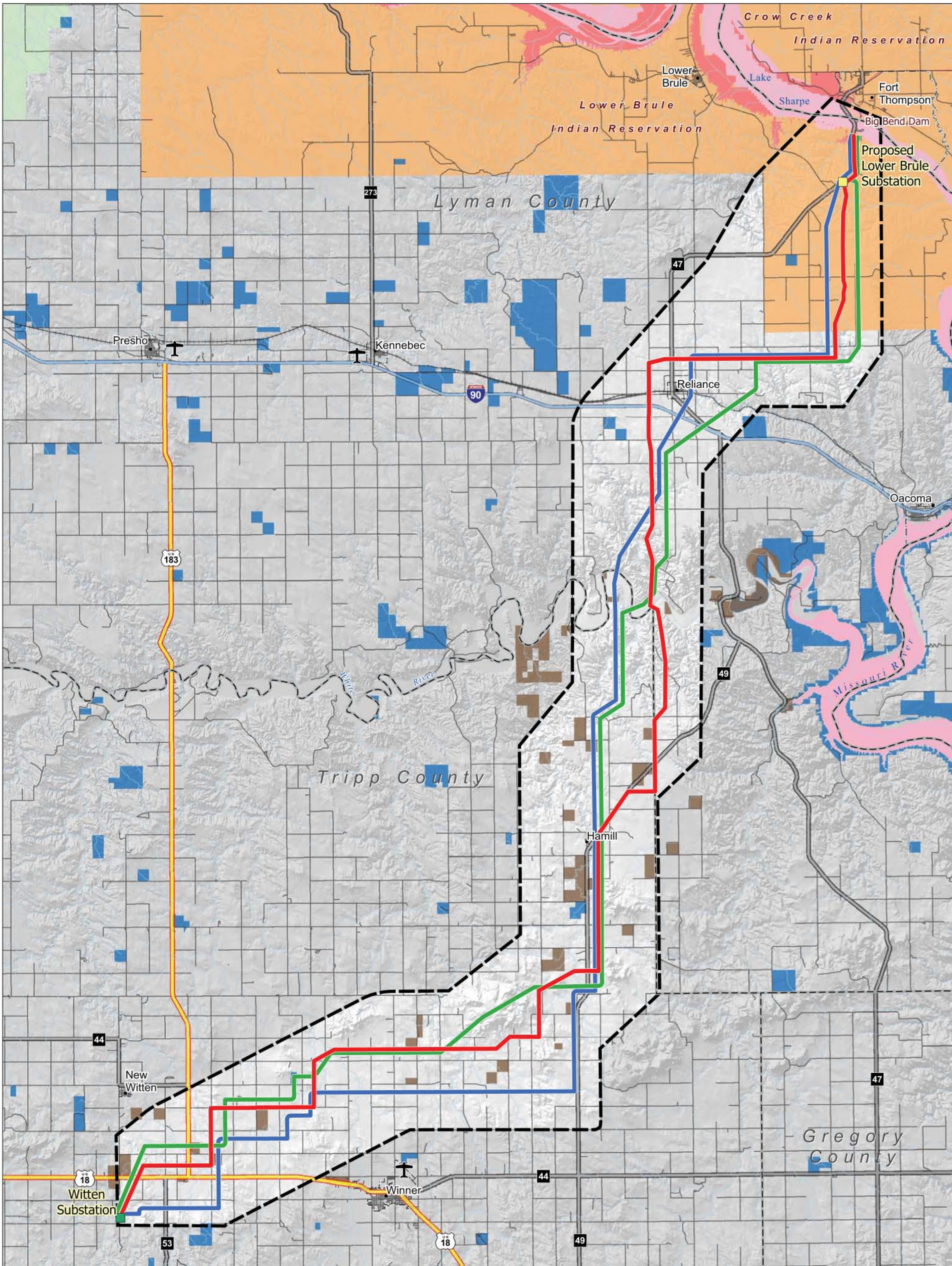
- The route has the greatest percentage of alignment paralleling linear features.
- The route is not within 150 feet of any known communications facilities.
- The route has the fewest crossings of perennial streams and the shortest length within 100 feet of perennial and intermittent streams.

Potentially unfavorable aspects of the Applicant-Preferred Route compared with the two alternative routes include:

- The Applicant-Preferred Route is longer than Routes 10 and 16.
- The centerline of the Applicant-Preferred Route encroaches on and crosses Indian Trust land for approximately 2,614 feet; although as previously described, Basin Electric will completely avoid this parcel during the easement acquisition process.
- Based on the centerline used in this analysis, the Applicant-Preferred Route had two residences within 500 feet of centerline compared to one residence along Routes 10 and 16. However, as a result of recent adjustments to the Applicant-Preferred Route, Basin Electric has confirmed there are presently no occupied residences within 500 feet of the centerline.
- The Applicant-Preferred Route has the greatest length crossing waterbodies and NWI wetlands.
- The Applicant-Preferred Route is the only one of the three retained routes that traverses a historic sharp-tailed grouse lek.

All of these resource issues will be thoroughly evaluated in the EA, and none of the issues identified in this preliminary screening of the alternatives appear to be insurmountable from a routing and permitting perspective. It is likely that all of the potential impacts associated with the Applicant-Preferred Route (or either of the alternative routes) can be minimized or avoided through minor adjustments as needed and through standard construction mitigation practices.

-This page intentionally left blank-



BIG BEND TO WITTEN TRANSMISSION PROJECT

Project Features
- Project Study Area
- Applicant-Preferred Route
- Route 10
- Route 16

Note: Routes 10 and 16 offset for display purposes.

Jurisdiction
- DOD - Army Corps of Engineers
- Recreation Areas
- BIA - Indian Reservation
- USFS - National Grassland
- State of South Dakota
- Indian Trust Land

Transportation
- Interstate
- U.S. Highway
- State Highway
- Other Road
- Railroad
- Airport

Boundaries
- County
- Municipal

Utility System
- Existing Substation
- Proposed Substation

APPLICANT-PREFERRED ROUTE AND SELECTED ALTERNATIVES

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

0 2.5 5
Miles

AECOM
717 17th Street Suite 2600
Denver, CO 80202

File: P:\2011\11180015.01Basin_LB2W\06GIS\6.3Layout\Resource_Maps\111121_Selected_Routes_Jurisdiction.mxd
Date Modified: November 21, 2011
Projection: NAD 1983 State Plane, South Dakota South, Feet
Data Sources: ESRI, BTS, US Census, Basin, USGS, SDGIS, USACE

FIGURE 4-1

-This page intentionally left blank-

5.0 REFERENCES

Basin Electric Power Cooperative. April 2011. Basin Electric Big Bend to Witten 230-kV Transmission Project Alternative Evaluation and Macro-Corridor Study

BTS (U.S. Department of Transportation, Bureau of Transportation Statistics), 2006. Data on the locations of airports. Available online at: http://www.bts.gov/programs/geographic_information_services/

FCC (Federal Communications Commission), 2009. Data on the locations of communications facilities. Available online at: http://wireless.fcc.gov/geographic/index.htm?job=licensing_database_extracts

NPS (National Park Service), 2008. Data on the location of properties listed on the National Register of Historic Places. Available online at: http://www.nps.gov/nr/research/

NRCS (U.S. Department of Agriculture, Natural Resources Conservation Service), 2011. Data on soils and soil type. Available online at: http://soildatamart.nrcs.usda.gov/

SDGIS (South Dakota Geographic Information System), 2011. Data on land ownership and jurisdiction. Available online at: http://arcgis.sd.gov/server/sdGIS/Data.aspx

TransCanada, 2009. Final Report, Keystone XL Pipeline, Integrated System Eastern Interconnection Transmission Impacts, Integrated System Network Load Study, May 15.

USACE (U.S. Army Corps of Engineers), 2003. Big Bend Dam/Lake Sharpe Master Plan, Missouri River, South Dakota, Update of Design Memorandum MB-90. October.

U.S. Census Bureau, 2010. Data on roads, railroads, and census landmarks from TIGER database. Available online at: http://www.census.gov/geo/www/tiger/tgrshp2010/tgrshp2010.html

U.S. Department of Agriculture, Rural Utilities Service. July 2011. Big Bend to Witten 230-kV Transmission Project Environmental Assessment Scoping Report.

USFWS (U.S. Fish and Wildlife Service), 2010. Data on the location of wetlands in the National Wetlands Inventory. Available online at: http://www.fws.gov/wetlands/Data/DataDownload.html

USGS (U.S. Geological Survey), 1999. National Hydrography Dataset. Data on the locations of streams, rivers, lakes and other water features. Available online at: http://nhd.usgs.gov/

USGS (U.S. Geological Survey), 2001. National Land Cover Dataset. Available online at: http://seamless.usgs.gov/index.php

This page intentionally left blank.

APPENDIX K

Historical Pipeline Incident Analysis

-This page intentionally left blank-

HISTORICAL PIPELINE INCIDENT ANALYSIS

The detail within the Pipeline and Hazardous Materials Safety Administration (PHMSA) incident and mileage reports was analyzed to show the distribution of historic spill volumes, incident causes, and frequencies of crude oil pipeline incidents in the PHMSA database. This analysis was done to understand what has occurred historically with respect to pipelines in the United States, and to provide input for spill impact analysis in this report. Although the results are not a direct indicator of how the proposed Project will act, it can provide insight into what could potentially occur with respect to spill volume, incident cause, and incident frequency.

1.0 BACKGROUND

The risk assessment of the previously proposed Project Final EIS (see the Supplemental EIS Appendix O, Pipeline Risk Assessment and Environmental Consequence Analysis) cited 1) the volumetric quantities of crude oil spilled in a pipeline spill event; 2) the frequency that such an event occurs; and 3) the causes of the events. PHMSA collects data on hazardous liquid pipeline systems operating in the U.S. These data can be used to provide insight into these three items.

PHMSA collects information that is available to the general public on both reportable pipeline incidents that have occurred and the total length of pipelines in operation from which the incidents have occurred.

Information collected for each incident includes:

- The date of each reportable incident;
- The hazardous liquid commodity associated with the pipeline involved in the incident;
- The volume of hazardous liquid commodity spilled in the incident;
- The part of the pipeline system from which the spill occurred;
- The diameter of the hazardous liquid pipeline involved in the incident; and
- The cause of the incident.

The total mileage of pipelines in operation in the United States is collected for each of the following:

- The type of hazardous liquid commodity transported; and
- The diameter of the pipeline.

In addition, for each individual pipeline system in operation in the United States, the number of breakout tanks in use is also collected. Defined in this document, linear elements refer to mainline pipe and girth welds and discrete elements are pipeline components such as pumping stations, mainline valves, and breakout tanks.

1.1 OBJECTIVE

The objective of this data analysis is to use PHMSA hazardous liquid pipeline incident data and hazardous liquid pipeline annual (mileage) data to determine the historical spill volumes, incident causes, and incident frequencies of crude oil pipeline spills in the United States. Additionally, this analysis provides separate determinations for pipeline mainline pipe and pipeline system discrete components.

1.2 METHOD

The method is to filter the PHMSA hazardous liquid incident database covering a fixed period of time by commodity type to obtain a subset of data specific to crude oil pipeline systems. Subsequent filtering by pipeline system component, pipeline diameter, and incident cause results in separate subsets of incident counts and associated reported spill volumes for pipeline mainline pipe, mainline valves, pipeline system tanks, and other discrete pipeline components. The historical spill size distributions and incident cause distributions can then be summarized for the time period covered.

By filtering the pipeline mileage data by commodity type and pipeline diameter, an estimate of the total mileage of pipeline in service over the same fixed time period is made. Dividing the number of incidents by the number of mile-years of pipeline in service provides the frequency of historic incidents per mile-year of pipeline. Dividing the pipeline tank incidents by the number of tanks in service over the time period provides the frequency of historic tank incidents per tank-year.

Finally, by estimating the average spacing of mainline valves and pumping stations on pipeline systems in service, the number of mainline valves and pumping stations in service can be approximated. Dividing the number of mainline valve incidents with the approximate number of mainline valves in service results in an approximate frequency of incidents per valve-year. Similarly, dividing the number of pipeline discrete incidents by the approximate number of pumping stations in service results in an approximate frequency of incidents per pumping station-year.

The number of incidents resulting from each filtering set is documented to provide a quick reference for error checking while performing the analysis.

1.3 ASSUMPTIONS

PHMSA incident and mileage data for the period from January 2002 through July 2012 (10.58 years of data) are sufficient for use and are most applicable to these estimates. Data prior to January 2002 had different reporting requirements and may not provide additional useful information.

Annual mileage for 2002 and 2003 is estimated by assuming each year’s mileage is the same as that for 2004, the first year for which detailed mileage information is provided in the PHMSA data. Accepting the small discrepancies resulting from this simplification (reflecting only 2 out of 10.58 years of data) is preferable to the alternative of not assessing incidents covering the same period which would then reflect only 8.5 years of data.

The mileage for January through July 2012 is estimated by multiplying the mileage from 2011 by 0.58 (the fraction of a year represented by January through July). Accepting this simplification is preferable to not including the incidents that occurred in January through July of 2012.

All reported database incidents are counted, even if the information was incomplete or unspecified (“blank” or “Unknown”, “Miscellaneous”, and “Other”).

2.0 RESULTS

The summaries show that:

- Spill volumes from the mainline pipeline tend to be larger than spills from discrete elements, other than tanks;
- Spill volumes from larger diameter pipelines tend to be larger than spills from smaller diameter pipelines;
- Spill volumes from pipeline tanks tend to be larger than mainline pipe spills when considering reported pipeline diameters;
- Spill volumes from pipeline tanks tend to be similar to mainline pipe spills for 16-inch and larger diameter pipelines;
- The dominant cause of a release for the mainline pipeline (linear) element is corrosion and outside force;
- Equipment failure is the primary cause for discrete equipment elements; and
- Incorrect operations represent a large proportion of reported incidents for tanks.

The PHMSA liquid incident dataset, which includes incidents from hazardous liquid pipelines, can be filtered to include only crude oil pipeline incidents. The PHMSA hazardous liquid pipeline incident data do not detail the type of crude oil (e.g., dilbit, synthetic crude oil [SCO], etc.) involved with each incident, and so the historic incident summaries cannot be specific to dilbit, SCO, or Bakken crude oil, but rather can only be specific to crude oil in general.

The historic incident data can be subdivided allowing historic spill volumes and incident causes from the mainline pipe to be assessed separately from discrete elements such as pumping stations, breakout tanks, valves, and other associated equipment.

Table 1 is a summary of hazardous liquid pipeline incidents reported to PHMSA for the January 2002 through July 2012 period and shows the incident breakdown by pipeline system element (mainline pipe, tanks, valves, and other discrete equipment items associated with pumping stations or pipeline systems). The incident counts are used to derive historic incident frequencies and spill volume distributions and for referencing incident cause breakdown.

For pipeline components, including the body of the pipeline itself and associated equipment, there were 1,692 reported crude oil incidents out of a total of 3,916 incidents in the entire hazardous liquid pipeline database for the time period referenced. Of the incidents contained in Table 1, the 2,224 incidents not related to crude oil are not salient to this evaluation. The remaining 1,692 incidents involving crude oil are used.

Table 1 Summary of PHMSA Database

Main Categories		Subset	
Description	**Number of Incidents**	**Description**	**Number of Incidents**
Hazardous liquid pipeline incidents	3,916	Non-crude oil pipeline incidents	2,224
		Crude oil pipeline incidents	**1,692**
Crude oil pipeline incidents	1,692	**Crude oil mainline pipe incidents**	**321**
		Crude oil pipeline, equipment incidents (not mainline pipe)	**1,027**
		Crude oil pipeline system, unspecified elements	344
Crude oil mainline pipe incidents	321	**16-inch or greater diameter**	**71**
		8-inch or 15-inch diameter	154
		Less than 8-inch diameter	52
		Diameter not provided	44
Crude oil pipeline, equipment incidents (not mainline pipe)	1,027	**Tanks**	**93**
		Valves	**25**
		Other discrete elements (pumps, fittings, etc.)	**909**

Source: PHMSA Hazardous Liquid Pipeline Incident Database, January 2002 through December 2009 and January 2010 through July 2012.

Notes:
Bold - Subsets of data used in this analysis.

Of these 1,692 incidents, 321 incidents were associated with the body of the pipeline or the welds connecting mainline pipe sections, and 1,027 incidents were associated with tanks, valves, and equipment at pumping stations. In this analysis, the 321 incidents are referred to as *Mainline Pipe* and the 1,027 are referred to as *Pipeline System*.

Also, 344 incidents were reported in such a way (such as with blank data fields) that it is not clear if they were associated with the mainline pipe of a pipeline or with a discrete element. Based on the low spill volumes of these incidents and the content of the extended descriptions of the item involved, most of these incidents are likely not associated with the body of a transmission pipeline.

The 321 mainline pipe incidents are divided according to the pipeline diameter involved, making three subsets as referenced in Table 1 for this analysis. For 44 of these incidents, the pipeline diameter was missing from the data. For the 1,027 incidents not involving the mainline pipe, subsets include tank incidents (referred to as *Tanks*), valve incidents (referred to as *Mainline Valves*), and incidents involving other discrete elements (referred to as *Other Discrete Elements*). These discrete elements include pumps, fittings, and other equipment items normally found at pumping stations or other fixed locations, and generally not found along the entire pipeline route as is the case of the mainline pipe itself and girth welds used to connect pipeline sections during pipeline installation.

The PHMSA data also include information on the pipelines in service in each calendar year since 2004. This information includes the pipeline length, the commodity transported, the pipeline diameter, the installation year, and the number of breakout tanks associated with the pipeline. This information is needed to determine the incident rate per mile-year of pipeline and the incident rate per tank-year.

Table 2 contains a summary of the mileage of crude oil pipelines in service during the same period of the incidents shown in Table 1; it is broken down into three size ranges. To apply the incident detail available for 2002 and 2003, the mileage of pipelines in service in 2004 is used as an estimate for those years due to the lack of detail provided in the PHMSA data available. Because the incidents for 2012 only include those through July 30 of the 2012 calendar year (this report being made before the end of the year), the total number of miles in service at the end of 2011 is factored by 0.58 (January through July) to represent only the mile-years of January through July 2012.

Table 2 Estimated Mile-Years of Crude Oil Pipelines, by Diameter

Year	Less than 8-inch Diameter	8-inch to 15-inch Diameter	16-inch or Larger Diameter	Total
2002	*6,109*[1]	*16,606*[1]	*26,549*[1]	*49,264*[1]
2003	*6,109*[1]	*16,606*[1]	*26,549*[1]	*49,264*[1]
2004	6,109	16,606	26,549	49,264
2005	7,512	16,703	24,516	48,732
2006	6,206	14,782	27,464	48,453
2007	6,733	15,491	27,264	49,488
2008	7,124	16,687	27,152	50,963
2009	7,074	15,607	30,043	52,723
2010	4,079	22,455	28,511	55,045
2011	4,231	22,705	28,270	55,206
2012 (through July)	*2,215*[2]	*11,883*[2]	*14,796*[2]	*28,894*[2]
Jan 2002 – July 2012	**63,500 mile-years**	**186,130 mile-years**	**287,665 mile-years**	**537,295 mile-years**

Source: PHMSA Liquid Annual Data, 2004 through 2011.

[1] PHMSA data not available, estimated based on 2004 mileage.
[2] Estimated number of mile-years for January through July 2012 as 0.58 x 2011 mileage.

To estimate the numbers of associated pipeline system equipment in service from January 2002 through July 2012, shown in Table 3, several assumptions are used.

For breakout tanks, the number of breakout tanks in service is taken directly from the PHMSA liquid annuals data, which includes the number of tanks in service for each pipeline system. However, only breakout tanks are included in these numbers and incidents attributed to tanks are not necessarily associated with breakout tanks. The number of tanks over which the incidents are taken is greater than the number of breakout tanks shown in Table 3. Note that using a lower number of tank-years will result in a higher estimated incident frequency as the fixed number of incidents is applied to a smaller number of tanks in service. Thus using the breakout tank count will result in conservatively high tank incident frequencies.

For mainline valves, a rough estimate of the number of valves in service is made by assuming that crude oil pipelines in the PHMSA liquid annual data have a mainline valve every 20 miles, on average; this is half the number that would be used for the proposed Project which will have such a valve roughly every 10 miles. Thus a rough estimate of the number of valve-years is the number of pipeline mile-years divided by 20.

Table 3 Estimated Pipeline Equipment-Years

Crude Oil Pipeline Item	Estimated Exposure January 2002 – July 2012	Comment
Breakout tanks	18,937 tank-years	As reported in PHMSA Liquid Annual Data[1]
Mainline valves	26,865 valve-years	Assumes a valve every 20 miles (half as many as planned for the proposed Project) for 537,295 mile-years of reported crude oil pipeline[2]
Pumping stations	11,647 pumping station-years	Assumes a pumping station every 46 miles for 537,295 mile-years of reported crude oil pipeline[3]

Source (for pipeline mileage and breakout tank numbers): PHMSA Liquid Annual Data 2004 through 2011.

[1] 2002 and 2003 tank count based on 2004 count; 2012 tank count taken as 0.58 x 2011 count.
[2] PHMSA does not detail the number of valves in service. Assumption used results in only a rough estimate.
[3] PHMSA does not detail the number of pumping stations in service. Assumption used results in only a rough estimate.

For pumping stations, a rough estimate of the number of pumping stations in service is made by assuming that crude oil pipelines in the PHMSA liquid annual data have similar distances between pumping stations as the proposed Project's average distance of about 46 miles. Thus a rough estimate of the number of pumping station-years is the number of pipeline mile-years divided by 46.

The estimates of pipeline mile-years shown in Table 2 along with the estimates of pipeline-associated-equipment–years shown in Table 3 allow differentiating the incident rate between linear elements (mainline pipe and girth welds) and discrete elements (such as pumping stations and breakout tanks).

A summary of crude oil pipeline incidents as reported to PHMSA from January 2002 through July 2012, including spill volume, incident frequency, and cause breakdown, is presented in the following tables and plots. These summaries were made by simple filtering of the publicly available PHMSA incident data summarized in Table 1. The incident frequencies contained in the tables are simply the number of incidents divided by the associated mile-years or equipment-years summarized in Table 2 and Table 3.

The remaining tables and figures present summaries of incident data, spill volumes, and incident causes for the data subsets, as follows:

- Pipeline, reported elements: Table 4, Figure 1, and Figure 2;
- Mainline pipe, reported pipeline diameters: Table 5, Figure 3, and Figure 4;
- Mainline pipe, 16-inch and larger diameter: Table 6 and Figure 5, and Figure 6;
- Pipeline system, tanks: Table 7, Figure 7, and Figure 8;
- Pipeline system, mainline valves: Table 8, Figure 9, and Figure 10; and
- Pipeline system, other discrete elements: Table 9, Figure 11, and Figure 12.

The summaries show that:

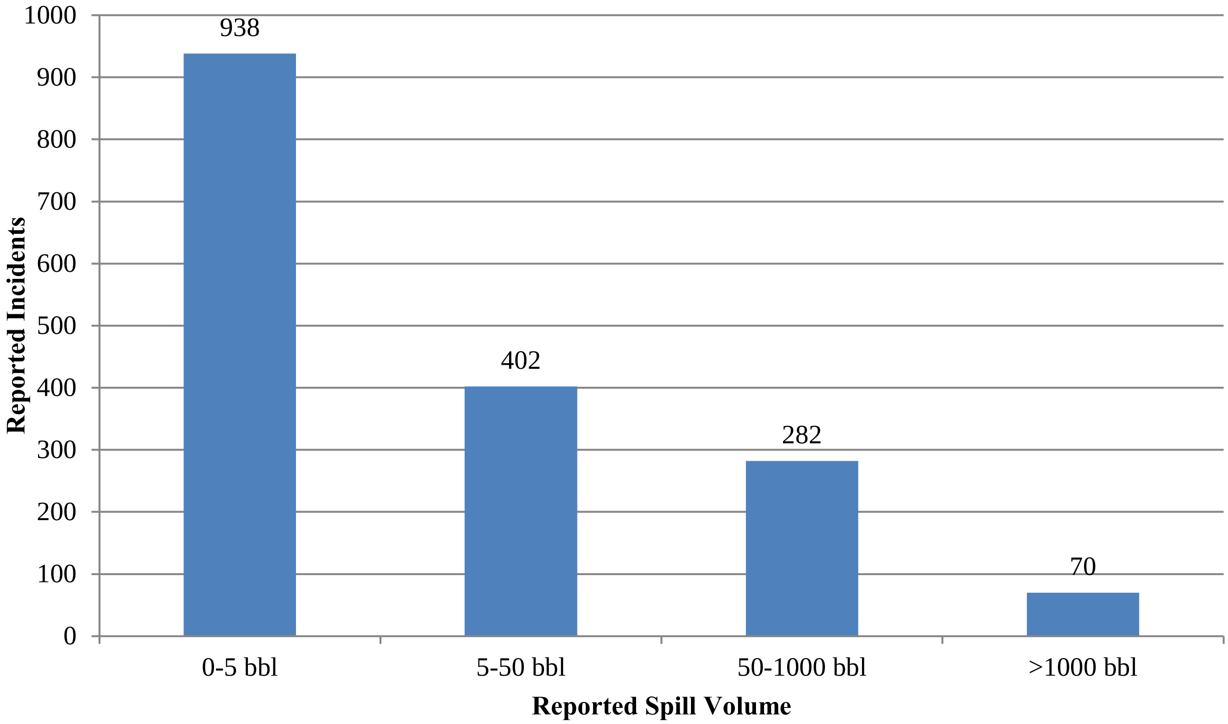
- Spill volumes from the mainline pipeline tend to be larger than spills from discrete elements, other than tanks;
- Spill volumes from larger diameter pipelines tend to be larger than spills from smaller diameter pipelines;

- Spill volumes from pipeline tanks tend to be larger than mainline pipe spills when considering reported pipeline diameters;
- Spill volumes from pipeline tanks tend to be similar to mainline pipe spills for 16 inch and larger diameter pipelines;
- The dominant cause for a release for the mainline pipeline (linear) element is corrosion and outside force;
- Equipment failure is the primary cause for discrete equipment elements; and
- Incorrect operations represent a large proportion of reported incidents for tanks.

Table 4 Historic Incident Summary, Onshore Crude Oil Pipeline, and Reported Elements

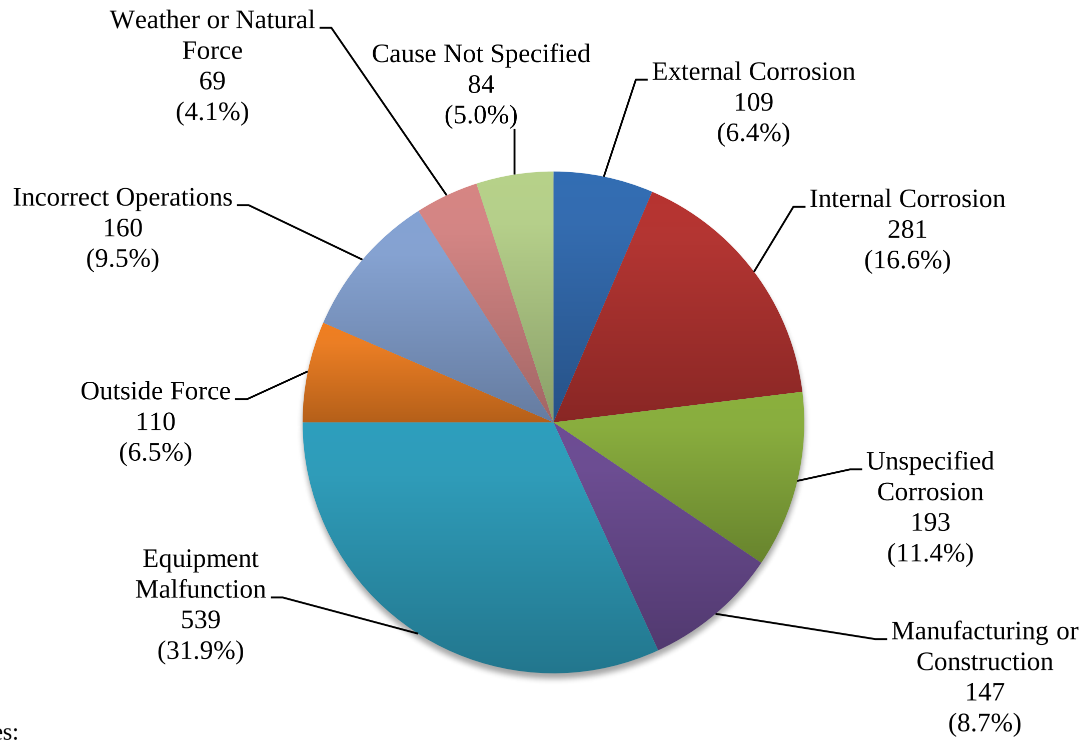
Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	1,692	Reported incidents
Pipeline Mileage	537,295	Mile-years
Incident Rate per Mile-Year	0.00313	Reported incident per mile-year
Equipment exposure	-	Not applicable
Incident Rate per equipment-year	-	Not applicable
Maximum Incident Volume Reported	49,000	Barrels
Median Incident Volume Reported	3	Barrels
Average Incident Volume Reported	264.6	Barrels
0-50 barrels	79%	Percentage of incidents
50-1000 barrels	17%	Percentage of incidents
1000 – 20,000 barrels	4%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
1,692 reported incidents between January 2002 and July 2012 (PHMSA)
Pipeline elements include mainline pipe, valves, breakout tanks, and pumping station equipment, and unspecified elements.

Figure 1 Historic Incident Spill Volumes, Onshore Crude Oil Pipeline, Reported Elements



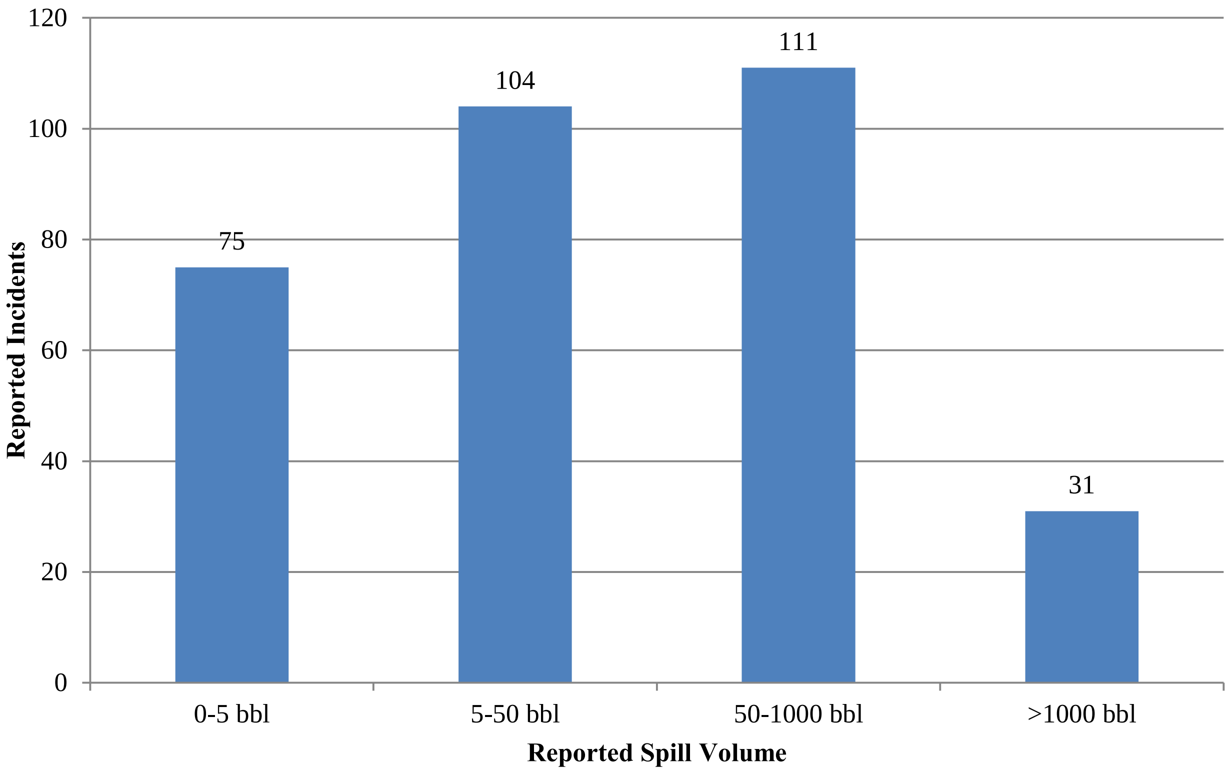
Notes:
1,692 incidents reported between January 2002 and July 2012 (PHMSA).
Pipeline elements include mainline pipe, valves, breakout tanks, and pumping station equipment.

Figure 2 Historic Incident Cause, Onshore Crude Oil Pipeline, Reported Elements

Table 5 Historic Incident Summary, Onshore Crude Oil Mainline Pipe, Reported Pipeline Diameters

Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	321	Reported incidents
Pipeline Mileage	537,295	Mile-years
Incident Rate per Mile-Year	0.00059	Reported incident per mile-year
Equipment exposure	-	Not applicable
Incident Rate per equipment-year	-	Not applicable
Maximum Incident Volume Reported	20,082	Barrels
Median Incident Volume Reported	30	Barrels
Average Incident Volume Reported	401.7	Barrels
0-50 barrels	56%	Percentage of incidents
50-1000 barrels	35%	Percentage of incidents
1000 – 20,000 barrels	9%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
321 reported incidents between January 2002 and July 2012 (PHMSA)
Pipeline elements include mainline pipe, and associated girth welds only.

Figure 3 Historic Incident Spill Volumes, Onshore Crude Oil Mainline Pipe, Reported Pipeline Diameters

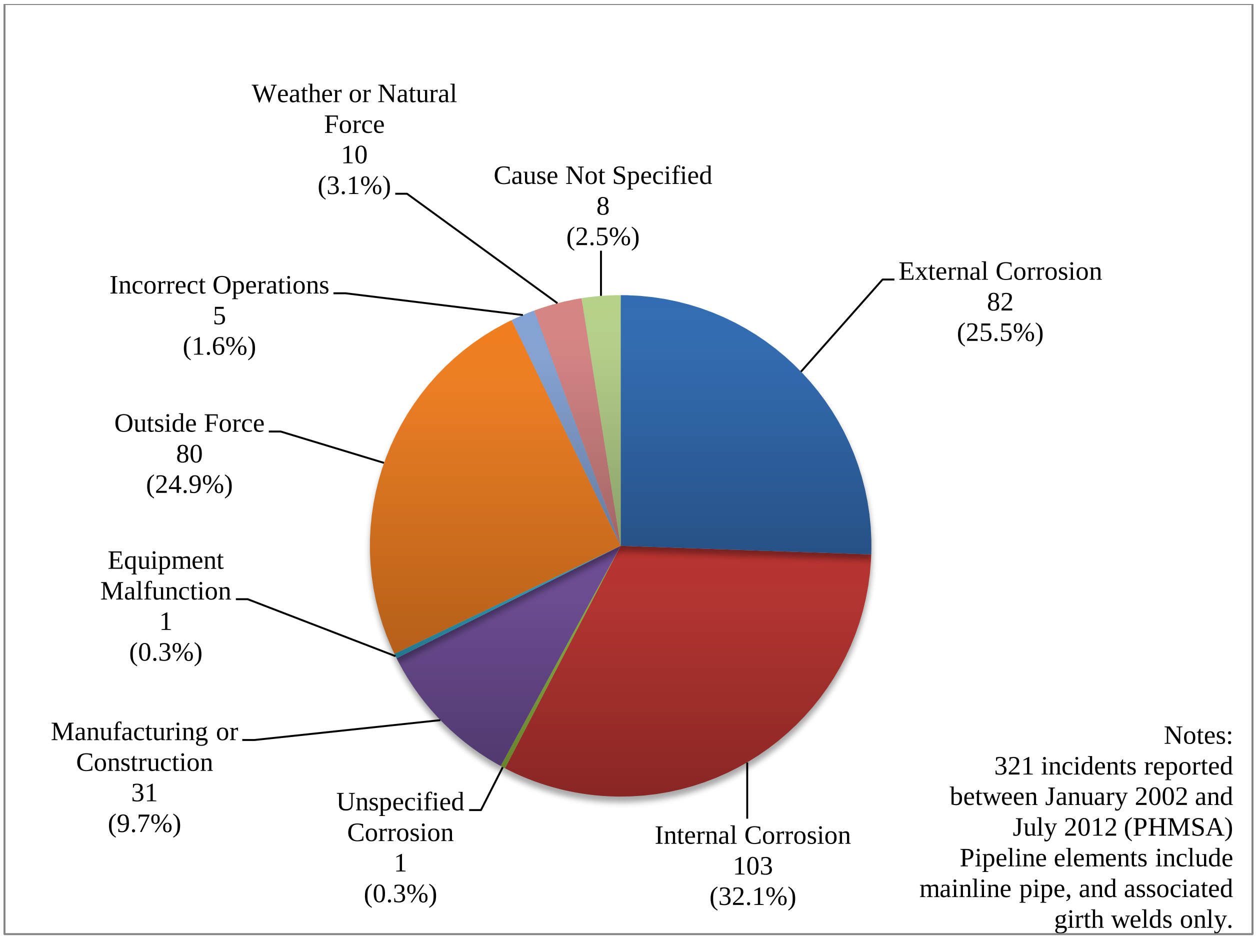
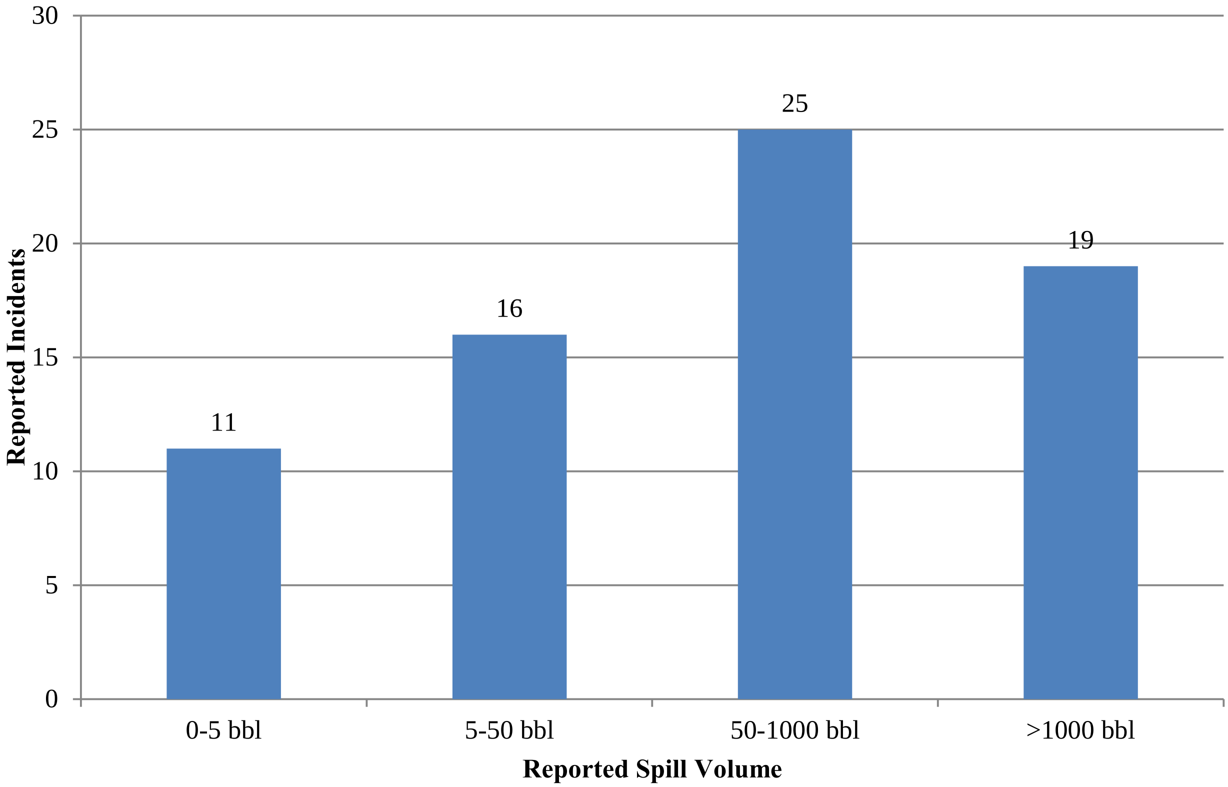


Figure 4 Historic Incident Cause, Onshore Crude Oil Mainline Pipe, Reported Pipeline Diameters

Table 6 Historic Incident Summary, Onshore Crude Oil Mainline Pipe, 16-inch Diameter and Larger

Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	71	Reported incidents
Pipeline Mileage	287,665	Mile-years
Incident Rate per Mile-Year	0.00025	Reported incident per mile-year
Equipment exposure	-	Not applicable
Incident Rate per equipment-year	-	Not applicable
Maximum Incident Volume Reported	20,082	Barrels
Median Incident Volume Reported	100	Barrels
Average Incident Volume Reported	1,116	Barrels
0-50 barrels	38%	Percentage of incidents
50-1000 barrels	36%	Percentage of incidents
1000 – 20,000 barrels	26%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
71 reported incidents between Jan 2002 and July 2012 (PHMSA).
Pipeline elements include mainline pipe, and associated girth welds only.

Figure 5 Historic Incident Spill Volumes, Onshore Crude Oil Mainline Pipe, Diameters 16-inch and Larger

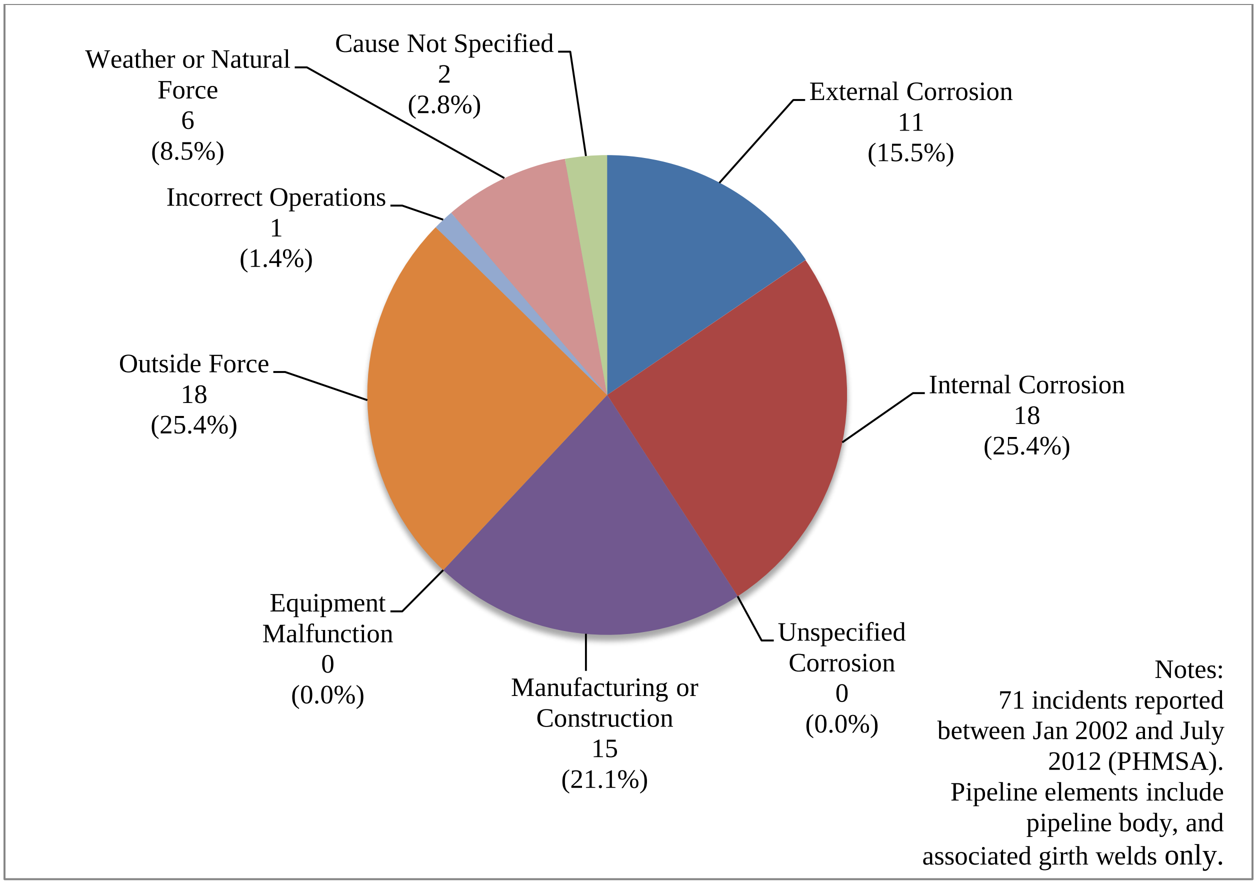
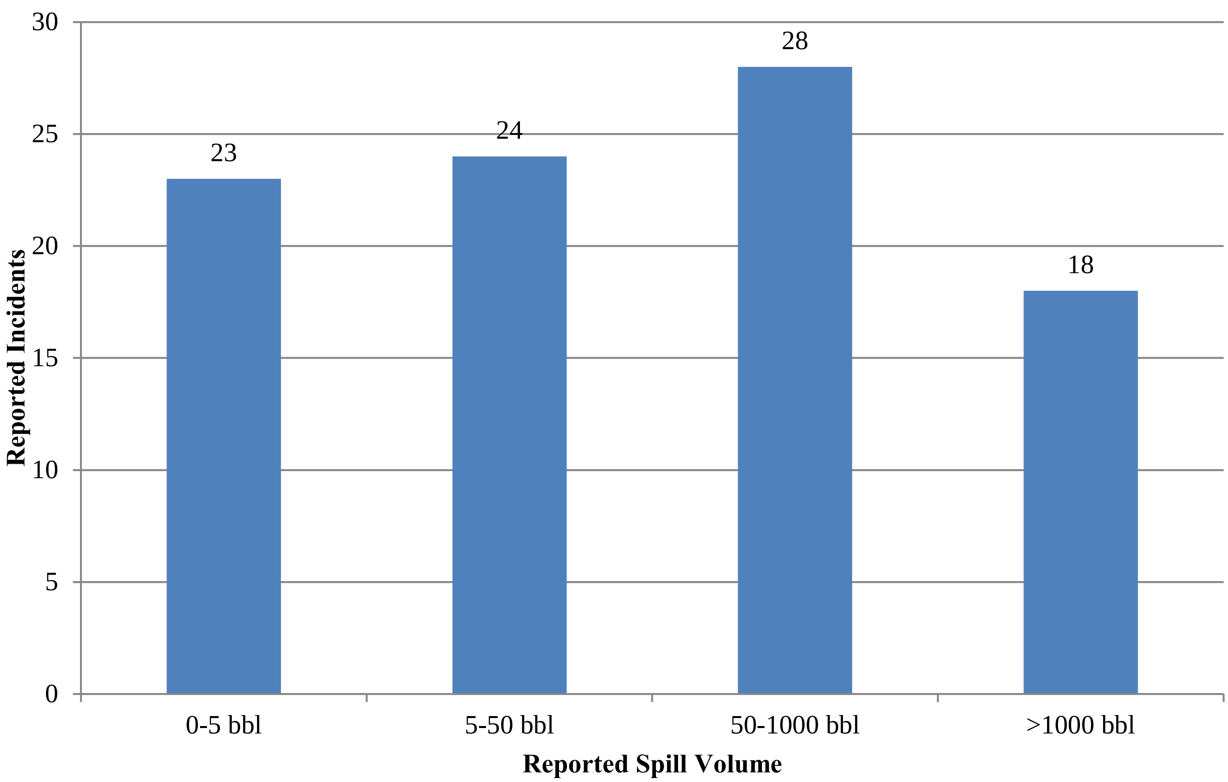


Figure 6 Historic Incident Cause, Onshore Crude Oil Mainline Pipe, Diameters 16-inch and Larger

Table 7 Historic Incident Summary, Onshore Crude Oil Pipeline System, Tanks

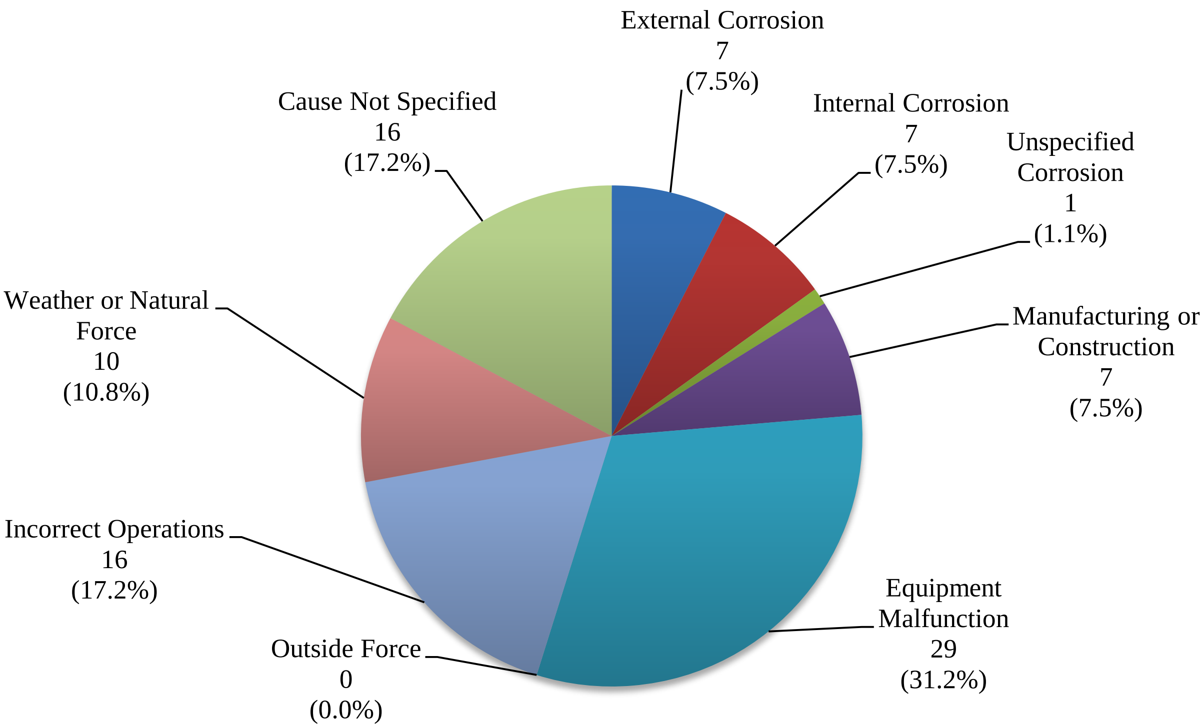
Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	93	Reported incidents
Pipeline Mileage	537,295	Mile-years
Incident Rate per Mile-Year	0.00017	Reported incident per mile-year
Equipment exposure	18,937	Tank-years
Incident Rate per equipment-year	0.0049	Incident per tank-year
Maximum Incident Volume Reported	49,000	Barrels
Median Incident Volume Reported	38	Barrels
Average Incident Volume Reported	1,720	Barrels
0-50 barrels	51%	Percentage of incidents
50-1000 barrels	30%	Percentage of incidents
1000 – 20,000 barrels	17%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
93 reported incidents between January 2002 and July 2012 (PHMSA).

Figure 7 Historic Incident Spill Volumes, Onshore Crude Oil Pipeline System, Tanks



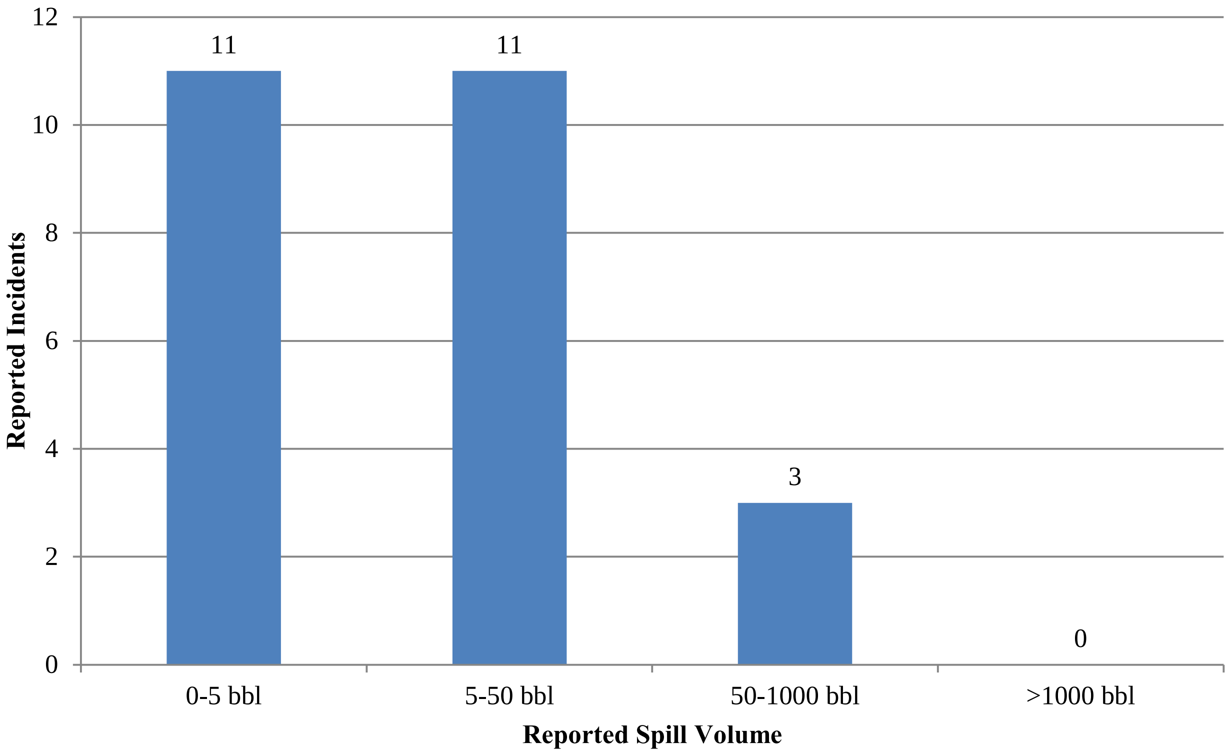
Notes:
93 incidents reported between Jan 2002 and July 2012 (PHMSA).

Figure 8 Historic Incident Cause, Onshore Crude Oil Pipeline System, Tanks

Table 8 Historic Incident Summary, Onshore Crude Oil Pipeline System, Mainline Valves

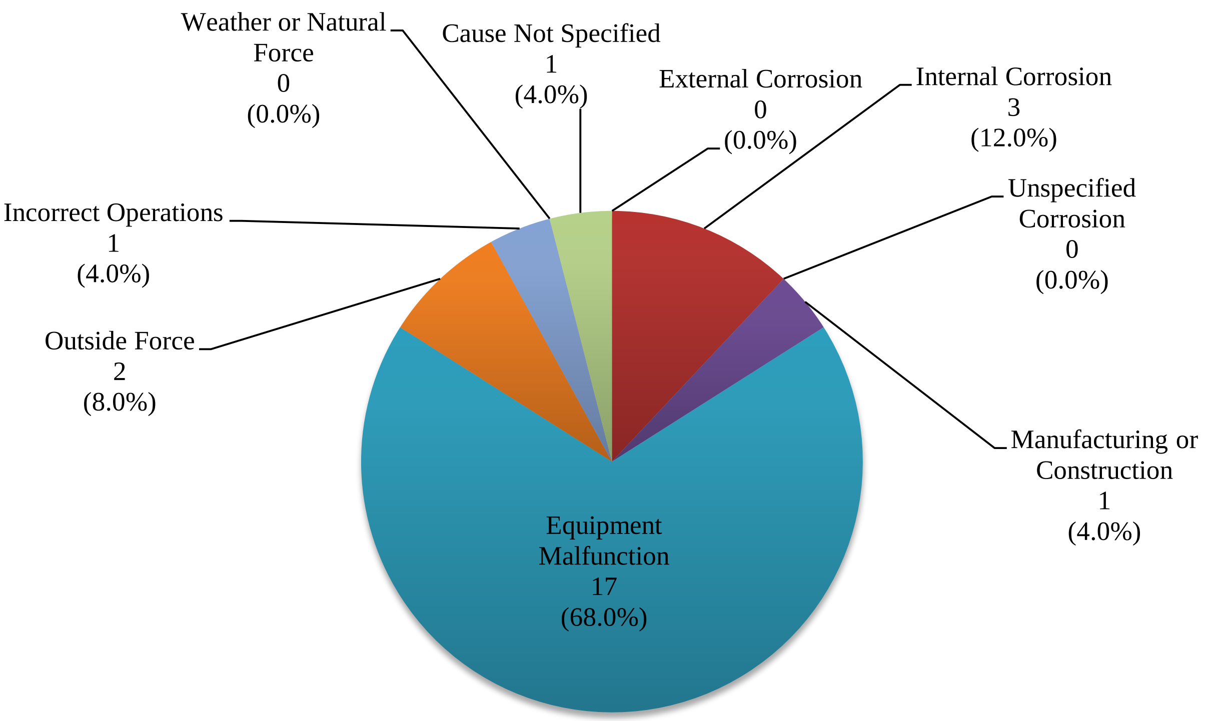
Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	25	Reported incidents
Pipeline Mileage	537,295	Mile-years
Incident Rate per Mile-Year	0.00005	Reported incident per mile-year
Equipment exposure	26,865	Valve-years
Incident Rate per equipment-year	0.00093	Incident per valve-year
Maximum Incident Volume Reported	500	Barrels
Median Incident Volume Reported	5.5	Barrels
Average Incident Volume Reported	33.7	Barrels
0-50 barrels	89%	Percentage of incidents
50-1000 barrels	11%	Percentage of incidents
1000 – 20,000 barrels	0%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
25 reported incidents between January 2002 and July 2012 (PHMSA).

Figure 9 Historic Incident Spill Volumes, Onshore Crude Oil Pipeline System, Mainline Valves



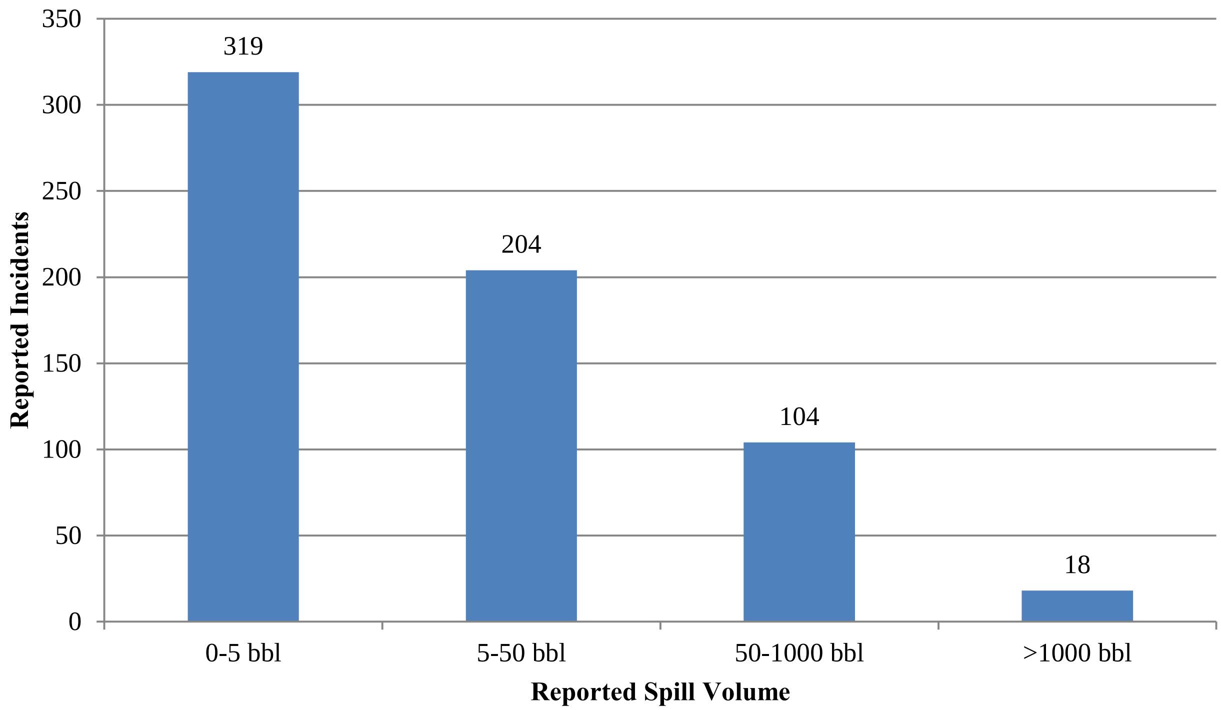
Notes:
25 incidents reported between Jan 2002 and July 2012 (PHMSA).

Figure 10 Historic Incident Cause, Onshore Crude Oil Pipeline System, Mainline Valves

Table 9 Historic Incident Summary, Onshore Crude Oil Pipeline System, Other Discrete Elements

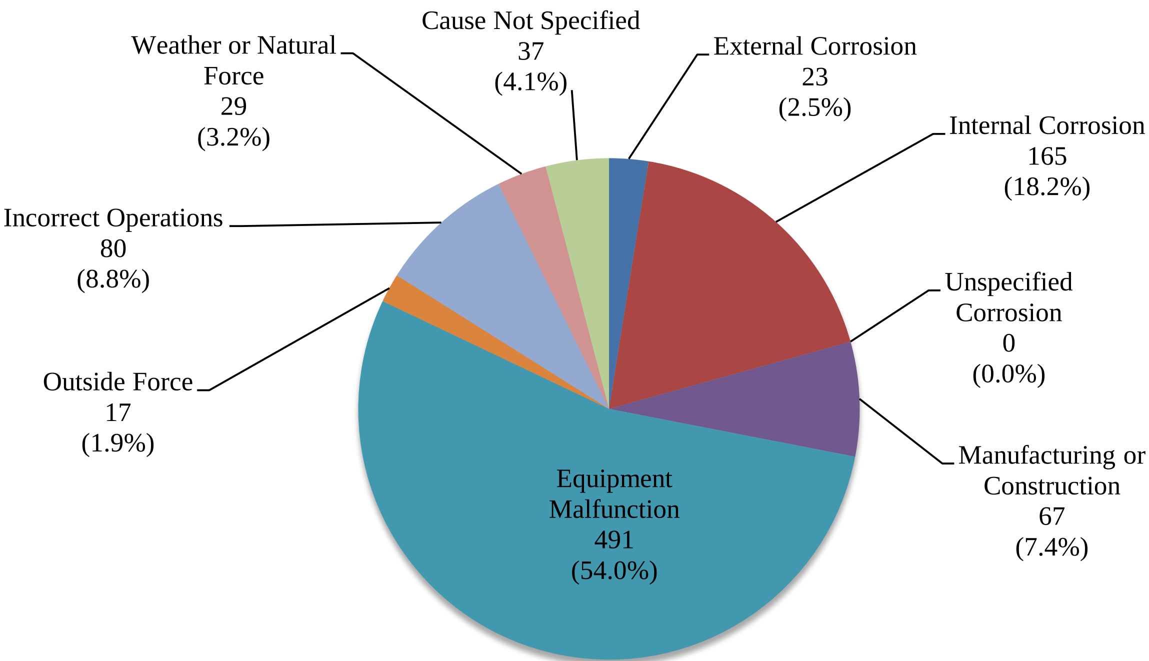
Item	Value	Unit
January 2002 – July 2012	10.58	Years of data
Total Incidents	645	Reported incidents
Pipeline Mileage	537,295	Mile-years
Incident Rate per Mile-Year	0.00168	Reported incident per mile-year
Equipment exposure	11,647	Pumping station-years
Incident Rate per equipment-year	0.055	Incident per pumping station-year
Maximum Incident Volume Reported	31,322	Barrels
Median Incident Volume Reported	5.0	Barrels
Average Incident Volume Reported	206.8	Barrels
0-50 barrels	81%	Percentage of incidents
50-1000 barrels	16%	Percentage of incidents
1000 – 20,000 barrels	3%	Percentage of incidents

Sources: PHMSA Hazardous Liquid Pipeline Incident Data 2002 – July 2012, and PHMSA Liquid Annual Pipeline Data 2004 – 2011.



Notes:
645 reported incidents between January 2002 and July 2012 (PHMSA).
Pipeline elements include pumping station equipment, but excludes tanks, valves, and mainline pipe.

Figure 11 Historic Incident Spill Volumes, Onshore Crude Oil Pipeline System, Other Discrete Elements



Notes:
909 incidents reported between January 2002 and July 2012 (PHMSA).
Pipeline elements include pumping station equipment, but excludes tanks, valves, and mainline pipe.

Figure 12 Historic Incident Cause, Onshore Crude Oil Pipeline System, and Other Discrete Elements

3.0 REFERENCES

PHMSA. See Pipeline and Hazardous Materials Safety Administration.

Pipeline and Hazardous Materials Safety Administration (PHMSA). 2002-2012. Hazardous Liquid Pipeline Incident Database, January 2002 through December 2009 and January 2010 through July 2012.

_________. 2004-2011. PHMSA Liquid Annual Pipeline Data, 2004 through 2011. Website: http://phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=a872dfa122a1d110VgnVCM1000009ed07898RCRD&vgnextchannel=3430fb649a2dc110VgnVCM1000009ed07898RCRD&vgnextfmt=print.

_________. 2002-2011. Hazardous Liquid Pipeline Incident Data 2002 – July 2012. Website: http://primis.phmsa.dot.gov/comm/reports/ safety/SIDA.html?nocache=2293.

-This page intentionally left blank-

APPENDIX L

Oil and Gas Wells within 1,320 ft of Proposed Right-of-Way

-This page intentionally left blank-

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
Steele City Segment												
17.7	44	25-071-05176-00-00	-107.313143	48.801712	Guyer, W.B.	JOHNSON 1	P&A - Approved	Wildcat Phillips	Phillips	8-35N-34E	C SW SW	3595
36.8	939	25-105-05153-00-00	-107.039888	48.605994	Guyer, W.B.	JONES 1	P&A - Approved	Wildcat Valley, E	Valley	20-33N-36E	C SW NE	3523
96.0	-79	25-055-21165-00-00	-106.258806	47.969621	Axem Resources Incorporated	FEDERAL 1-35	P&A - Approved	Wildcat McCone	McCone	35-26N-42E	NE NE	7200
124.5	347	25-055-21148-00-00	-105.863156	47.671766	Pioneer Prod	ARNSTON 1-18	P&A - Approved	Wildcat McCone	McCone	18-22N-46E	C NW NE	6301
125.3	828	25-055-21122-00-00	-105.852613	47.661029	Triton Oil And Gas Corp.	ARNSTON RANCH 1	P&A - Approved	Wildcat McCone	McCone	17-22N-46E	C SW SW	9125
127.1	-1168	25-055-05048-00-00	-105.825397	47.642980	Gulf Oil Corporation	TAIT 1	P&A - Approved	Wildcat McCone	McCone	28-22N-46E	NE NW	6241
127.6	-198	25-055-21004-00-00	-105.825790	47.635786	Gulf Oil Corporation	HAHESY 2	P&A - Approved	Wildcat McCone	McCone	28-22N-46E	NE SW	5856
127.9	204	25-055-05195-00-00	-105.820444	47.632156	Gulf Oil Corporation	HAHESY 1	P&A - Approved	Wildcat McCone	McCone	28-22N-46E	SW SE	5885
130.7	-557	25-055-21058-00-00	-105.766937	47.613947	Rainbow Resources Inc	BURLINGTON<>1-1	P&A - Approved	Wildcat McCone	McCone	1-21N-46E	C NW NW	7250
159.7	297	25-021-21014-00-00	-105.361421	47.310197	Jackson, L.B. Etal	NPRR 1-21-18	P&A - Approved	Wildcat Dawson	Dawson	21-18N-50E	C NW NW	5750
241.0	-271	25-025-21241-00-00	-104.371643	46.416976	Shell Oil Company	C33-29	Expired Permit	Pennel	Fallon	29-8N-59E	NW SE	0
257.0	900	25-025-22248-00-00	-104.210889	46.226288	Artex Oil Company	Vassar 14-33-6-60	Shut In	Wildcat Fallon	Fallon	33-6N-60E	SE SW	2235
259.8	-361	25-025-22247-00-00	-104.191231	46.189511	Artex Oil Company	Vassar 6-15-5-60	Shut In	Wildcat Fallon	Fallon	15-5N-60E	SE NW	2115
261.2	-716	25-025-05083-00-00	-104.181908	46.169575	Warner, Frank A.	ALLEN 30	P&A - Approved	Plevna	Fallon	22-5N-60E	SW NE SE	1057
264.4	967	25-025-22628-00-00	-104.175491	46.125994	Sands Oil Company	Johnson 2-8	Producing	Plevna, South	Fallon	8-4N-61E	NE NW	1965
264.6	-856	25-025-21921-00-00	-104.168295	46.123299	Bowers Oil & Gas, Inc.	Johnson 1-8	Producing	Plevna, South	Fallon	8-4N-61E	SE NE	1884
265.5	-10	25-025-21832-00-00	-104.170446	46.110220	Sands Oil Company	BR 31-17	Shut In	Wildcat Fallon	Fallon	17-4N-61E	NW NE	1900
268.6	1195	25-025-05004-00-00	-104.155312	46.067152	Shell Oil Company	NP 21-33	P&A - Approved	Wildcat Fallon	Fallon	33-4N-61E	NE NW	1733
268.9	-665	25-025-21333-00-00	-104.146255	46.063951	Sands Oil Company	Vollmer 2-33	Shut In	Wildcat Fallon	Fallon	33-4N-61E	SE NE	2040
270.2	983	25-025-22576-00-00	-104.140055	46.044917	Sands Oil Company	Tronstad 1-4	Permit to Drill	Wildcat Fallon	Fallon	4-3N-61E	C SE	0
272.2	1072	25-025-22601-00-00	-104.122117	46.022416	Sands Oil Company	Nichols 3-15	Permit to Drill	Gas Light	Fallon	15-3N-61E	SW NE	0
272.6	287	25-025-21208-00-00	-104.119753	46.016059	Sands Oil Company	Nichols 15-1	Producing	Gas Light	Fallon	15-3N-61E	E2 W2 SE	1950

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
273.1	174	25-025-21209-00-00	-104.119009	46.008905	Sands Oil Company	Ideker 22-1	Producing	Gas Light	Fallon	22-3N-61E	SW NE NE	1950
292.7	160	40 063 20046	-103.874466	45.811318	ARTHUR L SCHLAIKJER JR	SCHLAIKJER 1 PAINTER	P&A	WILDCAT	HARDING	4-21N-2E	NESE	4800
299.8	-151	40 063 20085	-103.750969	45.760500	AMAX PETROLEUM CORPORATION	AMAX 2-28 HANSEN	P&A	BUFFALO	HARDING	28-21N-3E	NENE	8700
299.8	-121	40 063 05033	-103.750972	45.760400	SHELL OIL COMPANY	SHELL CARTER 1 CLARKSON HANSEN	P&A	WILDCAT	HARDING	28-21N-3E	NENE	0
300.2	-1065	40 063 20262	-103.740798	45.758402	CITATION OIL AND GAS CORP	APACHE 27-2 CLARKSON	PRODUCING	BUFFALO	HARDING	27-21N-3E	SENW	8550
300.7	-351	40 063 20236	-103.735708	45.753534	CITATION OIL AND GAS CORP	MOSBACHER PRUET 27-1 CLARKSON	PRODUCING	BUFFALO	HARDING	27-21N-3E	NWSE	8700
301.2	-877	40 063 20246	-103.725258	45.753077	CITATION OIL AND GAS CORP	MOSBACHER 26-1 CLARKSON WBBRRU	INJECTING	BUFFALO	HARDING	26-21N-3E	NWSW	0
302.4	-811	40 063 20203	-103.704626	45.742184	CONTINENTAL RESOURCES INC	KOCH 12-36 STATE WBRRU	TA	BUFFALO	HARDING	36-21N-3E	SWNW	0
303.0	-975	40 063 20193 01	-103.694139	45.735153	CONTINENTAL RESOURCES INC	34-36H WBRRU	PRODUCING	BUFFALO	HARDING	36-21N-3E	SWSE	0
303.0	-975	40 063 20193	-103.694139	45.735153	CONTINENTAL RESOURCES INC	KOCH 34-36 STATE WBRRU	REENTERED	BUFFALO	HARDING	36-21N-3E	SWSE	8600
303.3	224	40 063 20478	-103.694984	45.729346	CONTINENTAL RESOURCES INC	KOCH 32-1 SMOLNIKER WBRRU	INJECTING	BUFFALO	HARDING	1-20N-3E	SWNE	0
303.7	-1235	40 063 20217 01	-103.686839	45.727780	CONTINENTAL RESOURCES INC	12-6 WBRRU	PRODUCING	BUFFALO	HARDING	6-20N-4E	SWNW	0
303.7	-1235	40 063 20217	-103.686839	45.727780	CONTINENTAL RESOURCES INC	KIRKWOOD 12-6 FEDERAL WBRRU	REENTERED	BUFFALO	HARDING	6-20N-4E	SWNW	8700
304.4	775	40 063 20429 01	-103.684296	45.716033	CONTINENTAL RESOURCES INC	WBRRU 11-7H	PRODUCING	BUFFALO	HARDING	7-20N-4E	NWNW	0
304.4	775	40 063 20429	-103.684296	45.716033	CONTINENTAL RESOURCES INC	SCI 11-7 TRAVERS WBRRU	REENTERED	BUFFALO	HARDING	7-20N-4E	NWNW	8450
324.3	593	40 063 20586	-103.425042	45.518252	FIDELITY EXPLORATION & PRODUCTION COMPANY	STATE 44-18	P&A	WILDCAT	HARDING	18-18N-6E	SESE	8300
324.4	176	40 063 20545	-103.421240	45.518232	SUMMIT RESOURCES INC	SUMMIT 13-17H STATE	P&A	WILDCAT	HARDING	17-18N-6E	SWSW	11750
324.6	-590	40 063 20284	-103.416533	45.518964	RANGER OIL COMPANY	RANGER 14-17 STATE	P&A	WILDCAT	HARDING	17-18N-6E	SESW	8500
504.2	-94	40 075 20002	-100.691920	43.962566	BOLYARD OIL AND GAS LTD	BOLYARD 1-18 REYNOLDS	P&A	WILDCAT	JONES	18-1S-29E	CNE	1900
Gulf Coast Segment * **												
0.0	-569	N/A	-96.750457	35.928624	FOSTER DRLG CO	DUNGAN	N/A	N/A	Lincoln	22-17N-5E	SESESE	3538
0.0	-569	N/A	-96.750456	35.928624	FOSTER DRLG CO	DUNGAN	N/A	N/A	Lincoln	22-17N-5E	SESESE	3538
0.2	849	N/A	-96.745994	35.925032	FOSTER DRLG CO	CARTER	N/A	N/A	Lincoln	26-17N-5E	SENWNW	4029
1.4	462	N/A	-96.730484	35.917712	FOSTER DRLG CO	DEACON	N/A	N/A	Lincoln	25-17N-5E	NENWSW	3440
1.9	-958	8103223.0	-96.721388	35.914098	OLSON OIL CO	ERL DEACON	N/A	N/A	Lincoln	25-17N-5E	SWSWSE	3525
1.9	-958	8103223.0	-96.721388	35.914098	OLSON OIL CO	ERL DEACON	N/A	N/A	Lincoln	25-17N-5E	SWSWSE	3525

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
2.0	284	8123312.0	-96.724148	35.910478	TIMSON OIL & GAS CO	HAPPY VALLEY	N/A	N/A	Lincoln	36-17N-5E	SENENW	3825
2.1	-1275	N/A	-96.719156	35.912285	TRIGG DRLG CO INC	STATE SCHOOL LAND	N/A	N/A	Lincoln	36-17N-5E	NENWNE	3498
2.6	923	8123784.0	-96.719156	35.903250	C M S ENERGY INC	SCHOOL LAND A	N/A	N/A	Lincoln	36-17N-5E	CTSENWSE	3919
4.3	-465	8106220.0	-96.700572	35.885020	THOMAS E BERRY	ORVILLE D COOK	N/A	N/A	Lincoln	6-16N-6E	SESESE	5900
4.7	1111	8122577.0	-96.700313	35.878422	RED FORK OIL CO	ETHRIDGE	N/A	N/A	Lincoln	7-16N-6E	EHSENE	3950
4.7	1111	8122577.0	-96.700313	35.878422	RESOURCE DEV INC	WRIGHT	N/A	N/A	Lincoln	7-16N-6E	EHSENE	3950
4.7	1111	8122577.0	-96.700313	35.878422	RESOURCE DEV INC	WRIGHT	N/A	N/A	Lincoln	7-16N-6E	EHSENE	3950
4.8	309	8120273.0	-96.697232	35.878614	C W DOBBINS	HANCOCK	N/A	N/A	Lincoln	8-16N-6E	SWNW	3110
5.0	1007	8120524.0	-96.697233	35.875000	WIL-MC OIL CORP	HANCOCK	N/A	N/A	Lincoln	8-16N-6E	NWSW	3483
7.6	-195	8121832.0	-96.682464	35.841202	SOUTHLAND OIL CORP	ETHRIDGE	N/A	N/A	Lincoln	20-16N-6E	SESESE	3742
7.7	767	8122190.0	-96.683500	35.837494	RESOURCE DEV INC	ETHRIDGE	N/A	N/A	Lincoln	29-16N-6E	SHNENE	3150
7.9	18	8121765.0	-96.679120	35.837604	F C D OIL CORP	SILL	N/A	N/A	Lincoln	28-16N-6E	SHNWNW	4050
8.4	-395	8122548.0	-96.674662	35.831279	RESOURCE DEV INC	SILL	N/A	N/A	Lincoln	28-16N-6E	CTNESW	3800
8.4	-395	8122548.0	-96.674662	35.831279	RESOURCE DEV INC	SILL	N/A	N/A	Lincoln	28-16N-6E	CTNESW	3800
8.6	846	N/A	-96.678006	35.828568	E F MORAN INC	PETERSON	N/A	N/A	Lincoln	28-16N-6E	NESWSW	3725
9.3	758	8122600.0	-96.673518	35.817614	RESOURCE DEV INC	THURSTON-ROLLMAN	N/A	N/A	Lincoln	33-16N-6E	NENESW	3950
9.8	-403	8122587.0	-96.665552	35.813096	RESOURCE DEV INC	MILTIMORE	N/A	N/A	Lincoln	33-16N-6E	CTSESE	3967
10.0	-389	N/A	-96.664219	35.810371	MID-CONTINENT PETROLEUM CORP	J B FLORER	N/A	N/A	Lincoln	4-15N-6E	NENENE	4135
10.3	324	8122588.0	-96.665333	35.805854	RESOURCE DEV INC	MILTIMORE	N/A	N/A	Lincoln	4-15N-6E	CTSENE	3958
10.4	1115	8120387.0	-96.665334	35.801829	CHEROKEE RESOURCES INC	GUIN	N/A	N/A	Lincoln	4-15N-6E	NESE	3696
10.5	-349	8122700.0	-96.662209	35.805122	SOPAC EXPL INC	STANLEY	N/A	N/A	Lincoln	3-15N-6E	SWSWNW	3926
10.5	-1263	8122474.0	-96.659981	35.806929	LITTLE RIVER ENERGY CO	STANLEY NORTH	N/A	N/A	Lincoln	3-15N-6E	NESWNW	3932
10.8	703	8106316.0	-96.662209	35.799701	BEN J TAYLOR	RUSSELL	N/A	N/A	Lincoln	3-15N-6E	NWSWSW	3880
10.8	1035	8100876.0	-96.662209	35.797894	DEMIER OIL CO	RUSSELL	N/A	N/A	Lincoln	3-15N-6E	SWSWSW	4075
10.9	1093	N/A	-96.659764	35.795944	ATMAR DRLG CO	RUSSELL	N/A	N/A	Lincoln	10-15N-6E	NENWNW	3644
11.0	-28	8122811.0	-96.657753	35.798797	DEMIER OIL CO	RUSSELL-DEMIER	N/A	N/A	Lincoln	3-15N-6E	WHSESW	4000
11.3	958	N/A	-96.657536	35.795944	TOTO GAS CO	BILL RUSSELL	N/A	N/A	Lincoln	10-15N-6E	NWNENW	3634
11.3	297	8121696.0	-96.655308	35.795944	WIL-MC OIL CORP	RUSSELL	N/A	N/A	Lincoln	10-15N-6E	NENENW	3980

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
11.4	-396	N/A	-96.652944	35.794137	GEORGE O FOLK	HOWELL	N/A	N/A	Lincoln	10-15N-6E	SWNWNE	3812
12.3	10	8122635.0	-96.651314	35.781299	DELAWARE WESTERN OIL CORP	ORR	N/A	N/A	Lincoln	15-15N-6E	WHNENWNE	4150
12.3	10	8122635.0	-96.651314	35.781299	RED FORK OIL CO	ORR	N/A	N/A	Lincoln	15-15N-6E	WHNENWNE	4150
12.3	10	8122635.0	-96.651314	35.781299	RESOURCE DEV INC	ORR	N/A	N/A	Lincoln	15-15N-6E	WHNENWNE	4150
13.0	-666	8120549.0	-96.646084	35.772263	FLOYD HUBBELL	#1 HOPEWELL	N/A	N/A	Lincoln	15-15N-6E	SENESE	3751
13.1	763	8100763.0	-96.650538	35.768649	HUBBELL DRLG CO	HALE	N/A	N/A	Lincoln	15-15N-6E	SESWSE	3225
13.5	956	N/A	-96.648310	35.763194	DAUBE CO	EGNEW	N/A	N/A	Lincoln	22-15N-6E	NWSENE	4230
13.6	-952	8122532.0	-96.642756	35.765973	RESOURCE DEV INC	NICCUM	N/A	N/A	Lincoln	23-15N-6E	CTNWNW	4075
13.7	-854	N/A	-96.641642	35.763262	DAUBE CO	EGNEW	N/A	N/A	Lincoln	23-15N-6E	NESWNW	3130
13.9	1172	8121959.0	-96.647440	35.758676	TARGA OIL & GAS INC	NICCUM	N/A	N/A	Lincoln	22-15N-6E	NESE	3498
14.2	-1010	8100252.0	-96.639416	35.756034	MCELREATH & HARVEY	JOHN B CHARLES	N/A	N/A	Lincoln	23-15N-6E	NWSESW	4222
14.4	1224	8101196.0	-96.646096	35.752193	J A HULL CO	RHODA FORD	N/A	N/A	Lincoln	27-15N-6E	NENENE	4333
14.5	79	8100072.0	-96.641685	35.750422	CORONADO OIL CO	LUMM HARWELL	N/A	N/A	Lincoln	26-15N-6E	SENWNW	3100
14.9	-358	N/A	-96.637232	35.746808	HUBBELL DRLG CO	LUMM	N/A	N/A	Lincoln	26-15N-6E	SESENW	4342
15.6	681	8120275.0	-96.635306	35.735863	FLOYD G HUBBELL	BARBER	N/A	N/A	Lincoln	35-15N-6E	SWNWNE	4257
16.0	465	8100938.0	-96.632642	35.730441	HUBBELL DRLG CO	GRAHAM	N/A	N/A	Lincoln	35-15N-6E	NENWSE	3727
16.0	465	8100938.0	-96.632642	35.730441	INTER-GLOBE ENERGY INC	GRAHAM	N/A	N/A	Lincoln	35-15N-6E	NENWSE	3050
16.1	-129	8121343.0	-96.630416	35.730441	INTER-GLOBE ENERGY INC	GRAHAM	N/A	N/A	Lincoln	35-15N-6E	NWNESE	3200
16.1	-1297	8100844.0	-96.626222	35.730527	HUBBELL DRLG CO	SCHOOL-HINDS	N/A	N/A	Lincoln	36-15N-6E	NWNWSW	4266
16.5	-694	8121650.0	-96.625109	35.726913	M M RESOURCES	ARTIE	N/A	N/A	Lincoln	36-15N-6E	CTNHSWSW	4250
16.7	1262	8121967.0	-96.629718	35.722274	M M RESOURCES INC	CARRIE	N/A	N/A	Lincoln	2-14N-6E	WHNENE	4308
16.7	162	8121963.0	-96.626222	35.723288	M M RESOURCES	DAVID	N/A	N/A	Lincoln	1-14N-6E	NWNWNW	3775
16.7	-169	N/A	-96.624738	35.722960	R H SIEGFRIED INC	UNIT 6	N/A	N/A	Lincoln	1-14N-6E	NENWNW	3755
16.8	30	8121873.0	-96.625109	35.722385	M M RESOURCES INC	LYNN	N/A	N/A	Lincoln	1-14N-6E	CTNWNW	3465
17.4	520	N/A	-96.621268	35.714195	ROXANA PETROLEUM CORP	ZOLLERS	N/A	N/A	Creek	1-14N-6E	SWNESW	4180
17.4	-193	3702838.0	-96.618591	35.714323	ROXANA PETROLEUM CORP	COYARKAH	N/A	N/A	Creek	6-14N-7E	NWSWSW	4185
17.4	899	8105877.0	-96.621261	35.712254	ROXANA PETROLEUM CORP	ZOLLERS	N/A	N/A	Creek	1-14N-6E	NWSESW	4156
17.4	899	8105877.0	-96.621261	35.712254	ROXANA PETROLEUM CORP	EFFIE ZOLLERS	N/A	N/A	Creek	1-14N-6E	NWSESW	4170

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
17.5	626	N/A	-96.620034	35.712363	AMERADA PETROLEUM CORP	WELCH	N/A	N/A	Creek	1-14N-6E	NESESW	4183
17.5	388	3702836.0	-96.618618	35.712393	ROXANA PETROLEUM CORP	CO-YAR-KAH	N/A	N/A	Creek	6-14N-7E	SWSWSWSW	4177
17.5	388	3702836.0	-96.618618	35.712393	ROXANA PETROLEUM CORP	COYARKAH	N/A	N/A	Creek	6-14N-7E	SWSWSWSW	4158
17.8	838	3700575.0	-96.618760	35.710488	WAITE PHILLIPS CO	EDDIE JACK	N/A	N/A	Creek	7-14N-7E	NWNWNW	3590
17.8	-19	3702820.0	-96.615877	35.710452	WAITE PHILLIPS CO	EDDIE JACK	N/A	N/A	Creek	7-14N-7E	NENWNW	4145
17.8	632	3722101.0	-96.618069	35.710425	F A MORAN	MATHES	N/A	N/A	Creek	7-14N-7E	NWNWNW	2061
17.8	312	3702832.0	-96.616990	35.709549	DALE SNEED	J M HOOD	N/A	N/A	Creek	7-14N-7E	CTNWNW	1820
17.9	993	N/A	-96.619282	35.708661	CHAS F NOBLE	MARY DOWELL	N/A	N/A	Creek	12-14N-6E	NENENW	4185
17.9	-19	3702819.0	-96.615877	35.708645	WAITE PHILLIPS CO	EDDIE JACK	N/A	N/A	Creek	7-14N-7E	SENWNW	4145
17.9	131	3702818.0	-96.616383	35.708618	WAITE PHILLIPS CO	E JACK	N/A	N/A	Creek	7-14N-7E	SWNWNW	4054
18.0	-65	3702813.0	-96.615877	35.706838	C F FARREN ET AL	HOOD	N/A	N/A	Creek	7-14N-7E	NESWNW	4179
18.1	644	3702811.0	-96.618599	35.706756	C F FARREN	HOOD	N/A	N/A	Creek	7-14N-7E	NWSWNW	4168
18.1	-364	3702812.0	-96.615877	35.705031	C F FARREN	HOOD (LOT 2)	N/A	N/A	Creek	7-14N-7E	SESWNW	4190
18.1	375	3727554.0	-96.618103	35.705935	DELPHI INTL INC-DBA DELPHI RESOURCES	KEYWEST	N/A	N/A	Creek	7-14N-7E	WHSWNW	4172
18.1	375	3727554.0	-96.618103	35.705935	LEASEHOLD MANAGEMENT CORP	KEYWEST	N/A	N/A	Creek	7-14N-7E	WHSWNW	4172
18.2	341	3702822.0	-96.618599	35.704949	PULASKI OIL CO ET AL	HOOD	N/A	N/A	Creek	7-14N-7E	SWSWNW	4148
18.2	537	N/A	-96.619282	35.705046	UNION PETROLEUM & SUPPLY CO	J S SCOTT	N/A	N/A	Creek	12-14N-6E	NESENW	4153
18.2	1133	N/A	-96.621507	35.705046	HARMACK PETROLEUM CO	REBECCA SCOTT	N/A	N/A	Creek	12-14N-6E	NWSENW	4170
18.3	465	N/A	-96.619282	35.703239	AMERADA PETROLEUM CORP	JOHN LEWIS	N/A	N/A	Creek	12-14N-6E	SESENW	4168
18.3	465	N/A	-96.619282	35.703239	J V BAILEY	LOT 1 & 2 BLCK 12 KEYWEST TWST	N/A	N/A	Creek	12-14N-6E	SESENW	4175
18.3	133	3716891.0	-96.618103	35.703224	AMERADA PETROLEUM CORP	JOHN LEWIS	N/A	N/A	Creek	7-14N-7E	NWNWSW	0
18.3	501	N/A	-96.619052	35.702336	AMERADA PETROLEUM CORP	JOHN LEWIS	N/A	N/A	Creek	12-14N-6E		4156
18.4	-1126	3702825.0	-96.613653	35.703224	PURE OIL CO	REUBEN STOVER	N/A	N/A	Creek	7-14N-7E	NWNESW	4147
18.4	-99	ZZ438850	-96.616924	35.702320	MORRISEY DRLG CO	JOHN LEWIS	N/A	N/A	Creek	7-14N-7E	NWSW	4163
18.5	-924	3702826.0	-96.613653	35.701417	PURE OIL CO	R STOVER	N/A	N/A	Creek	7-14N-7E	SWNESW	4138
18.5	10	3728617.0	-96.616582	35.700472	STROUD OIL PROPERTIES INC	BATCHELOR	N/A	N/A	Creek	7-14N-7E	NESWSW	3800

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
18.5	-884	ZZ247778	-96.613653	35.701061	SUN OIL CO (DE)	JOHN LEWIS	N/A	N/A	Creek	7-14N-7E	SWNESW	0
18.5	537	3700576.0	-96.618103	35.699610	ROXANA PETROLEUM CORP	J LEWIS	N/A	N/A	Creek	7-14N-7E	NWSWSW	2015
18.6	-808	3720508.0	-96.613653	35.700376	SUNRAY D X OIL CO	STROUD PRUE SD UNIT	N/A	N/A	Creek	7-14N-7E	NWSESW	2960
18.6	-93	3702830.0	-96.615878	35.699610	ROXANA PETROLEUM CORP (WOLVERINE PETROLEUM)	J LEWIS	N/A	N/A	Creek	7-14N-7E	NESWSW	4176
18.6	912	N/A	-96.619080	35.698721	SUNRAY D X OIL CO	STROUD PRUE SD UNIT TR 35	N/A	N/A	Creek	12-14N-6E	NESESW	3010
18.6	1096	N/A	-96.619282	35.697818	AMERADA PETROLEUM CORP	JOHN LEWIS	N/A	N/A	Creek	12-14N-6E	NESESW	4149
18.7	216	3702834.0	-96.615878	35.697803	SUNRAY D X OIL CO	STROUD PRUE SD UNIT TR 20	N/A	N/A	Creek	7-14N-7E	SESWSW	2990
18.7	1097	3703021.0	-96.618101	35.696113	SUN EXPL & PRODUCTION CO	STROUD PRUE UNIT	N/A	N/A	Creek	18-14N-7E	NWNWNW	2666
18.7	1097	3703021.0	-96.618101	35.696113	MIDSTATES OIL CORP	ESTATE LAND CO	N/A	N/A	Creek	18-14N-7E	NWNWNW	2666
18.8	-927	3702831.0	-96.611427	35.697803	SHELL OIL CO	J LEWIS B	N/A	N/A	Creek	7-14N-7E	SESESW	2931
18.8	-51	3703009.0	-96.613651	35.696113	SUN EXPL & PRODUCTION CO	STROUD PRUE UNIT	N/A	N/A	Creek	18-14N-7E	NWNENW	2945
18.8	-51	3703009.0	-96.613651	35.696113	JOHN J FLEET ET AL	FOUSHEE	N/A	N/A	Creek	18-14N-7E	NWNENW	2945
18.9	849	3703020.0	-96.615876	35.694306	MIDSTATES OIL CORP	ESTATE LAND CO	N/A	N/A	Creek	18-14N-7E	SENWNW	3010
19.0	-312	3703008.0	-96.611426	35.694306	JOHN J FLEET ET AL	A L FOUSHEE	N/A	N/A	Creek	18-14N-7E	SENENW	2946
19.1	547	3703013.0	-96.613651	35.692498	HUBBELL & WEBB ET AL	FOUSHEE	N/A	N/A	Creek	18-14N-7E	NWSENW	2928
19.1	547	3703019.0	-96.613651	35.692498	SUN EXPL & PRODUCTION CO	STROUD PRUE UNIT	N/A	N/A	Creek	18-14N-7E	NWSENW	2964
19.1	547	3703019.0	-96.613651	35.692498	MIDSTATES OIL CORP	ESTATE LAND CO	N/A	N/A	Creek	18-14N-7E	NWSENW	2964
19.2	-706	3703029.0	-96.609194	35.692498	SUN EXPL & PRODUCTION CO	STROUD PRUE UNIT	N/A	N/A	Creek	18-14N-7E	NWSWNE	2876
19.2	-706	3703029.0	-96.609194	35.692498	VIERSEN OIL & GAS CO	A A VIERSEN	N/A	N/A	Creek	18-14N-7E	NWSWNE	2876
19.2	-706	3703029.0	-96.609194	35.692498	OIL CENTER OPERATING INC	STROUD PRUE SAND UNIT	N/A	N/A	Creek	18-14N-7E	NWSWNE	2876
19.2	136	3703024.0	-96.611426	35.690691	SUNRAY DX OIL CO	STROUD PRUE SD UNIT TR 37	N/A	N/A	Creek	18-14N-7E	SESENW	2985
19.3	1023	3716909.0	-96.613652	35.688884	TEXAS CO	JOHNNIE GIBSON	N/A	N/A	Creek	18-14N-7E	NWNESW	2975
19.3	-861	3703028.0	-96.606969	35.690691	VIERSEN OIL & GAS CO	A A VIERSEN	N/A	N/A	Creek	18-14N-7E	SESWNE	2873
19.4	-41	3716910.0	-96.609195	35.688884	M L GASKILL	MALEY-LESLIE	N/A	N/A	Creek	18-14N-7E	NWNWSE	2905
19.4	-41	3703025.0	-96.609195	35.688884	SUNRAY DX OIL CO	STROUD PRUE SD UNIT TR 40	N/A	N/A	Creek	18-14N-7E	NWNWSE	2940
19.7	-543	3726185.0	-96.606970	35.685270	RED ROCK PETROLEUM	POLAR	N/A	N/A	Creek	18-14N-7E	NESWSE	3086
19.7	-543	3726185.0	-96.606970	35.685270	N B I SERVICES INC	POLAR	N/A	N/A	Creek	18-14N-7E	NESWSE	3102

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
21.4	185	3702861.0	-96.600285	35.661729	BURKE-GREIS OIL CORP	FOLLANSBEE	N/A	N/A	Creek	29-14N-7E	SWSWNW	2884
21.4	-1055	3700578.0	-96.595836	35.661729	SINCLAIR-PRAIRIE OIL CO	COMMUNITY ARTHUR TEBE	N/A	N/A	Creek	29-14N-7E	SWSENW	4227
21.5	1024	3702867.0	-96.602464	35.659896	BURKE-GREIS OIL CORP	VANDERSLICE	N/A	N/A	Creek	30-14N-7E	NENESE	2893
21.5	1024	3702867.0	-96.602464	35.659896	BURKE-GREIS OIL CORP	VANDERSLICE	N/A	N/A	Creek	30-14N-7E	NENESE	2875
21.5	411	3702862.0	-96.600285	35.659922	A J PETERS	COHN	N/A	N/A	Creek	29-14N-7E	NWNWSW	2860
21.5	411	N/A	-96.600285	35.659922	A J PETERS	HUBBELL	N/A	N/A	Creek	29-14N-7E	NWNWSW	2860
21.8	676	3702865.0	-96.599173	35.655404	C A THOMAS	COHN	N/A	N/A	Creek	29-14N-7E	CTSWSW	2902
23.2	177	10722869.0	-96.589071	35.636279	ENTERPRISE EXPL INC	PLATO	N/A	N/A	Okfuskee	5-13N-7E	CTSENWNE	2792
23.5	-384	10722932.0	-96.586847	35.632665	ENTERPRISE EXPL INC	PLATO	N/A	N/A	Okfuskee	5-13N-7E	CTSWSENE	3180
23.6	927	10721808.0	-96.591294	35.630858	CHAMPLIN EXPL INC	MCGEHEE	N/A	N/A	Okfuskee	5-13N-7E	CTNWNWSE	4070
23.6	927	10721808.0	-96.591294	35.630858	C W INVESTMENTS	PLATO	N/A	N/A	Okfuskee	5-13N-7E	CTNWNWSE	2833
23.6	927	10721808.0	-96.591294	35.630858	N B I SERVICES INC	PLATO	N/A	N/A	Okfuskee	5-13N-7E	CTNWNWSE	2833
23.8	-1027	10722756.0	-96.584625	35.629050	C W INVESTMENTS	PLATO	N/A	N/A	Okfuskee	5-13N-7E	CTSENESE	3625
23.9	332	10722843.0	-96.589071	35.627243	ENTERPRISE EXPL INC	PLATO	N/A	N/A	Okfuskee	5-13N-7E	NESWSE	3270
24.0	-963	10722764.0	-96.584625	35.626039	C W INVESTMENTS	PLATO	N/A	N/A	Okfuskee	5-13N-7E	NHSESESE	882
24.0	-963	10722764.0	-96.584625	35.626039	ENTERPRISE EXPL	PLATO	N/A	N/A	Okfuskee	5-13N-7E	NHSESESE	882
24.0	-960	10722746.0	-96.584625	35.625902	C W INVESTMENTS	PLATO	N/A	N/A	Okfuskee	5-13N-7E	SESESE	3625
24.0	620	10722770.0	-96.589913	35.625436	C W INVESTMENTS	PLATO	N/A	N/A	Okfuskee	5-13N-7E	WHSESWSE	3671
24.1	399	10722862.0	-96.589034	35.623579	ENTERPRISE EXPL INC	PLATO	N/A	N/A	Okfuskee	8-13N-7E	NENWNE	3193
24.1	-952	10722854.0	-96.584486	35.623579	ENTERPRISE EXPL INC	PLATO	N/A	N/A	Okfuskee	8-13N-7E	CTNENENE	3665
24.3	-883	N/A	-96.584588	35.621772	JAY PETROLEUM INC	CRAIN	N/A	N/A	Okfuskee	8-13N-7E	CTSENENE	1540
24.3	-880	10721120.0	-96.584588	35.621663	WOODS DRLG CO	CRAIN	N/A	N/A	Okfuskee	8-13N-7E	SENENE	3121
24.4	829	10730218.0	-96.590145	35.619061	HUFFMAN & MALLOY	CRAIN	N/A	N/A	Okfuskee	8-13N-7E	CTSWNE	3165
24.7	-606	10720927.0	-96.581439	35.619114	JAY PETROLEUM INC	ED BAILEY	N/A	N/A	Okfuskee	9-13N-7E	CTSWNW	4070
24.8	-1045	10722713.0	-96.580328	35.620017	RICHARD LEON BAILEY	ED BAILEY (UNCLE ED)	N/A	N/A	Okfuskee	9-13N-7E	NESWNW	3653
25.3	-132	N/A	-96.576994	35.611885	TRANS-VIKING PETROLEUM INC	SUNRAY UNIT	N/A	N/A	Okfuskee	9-13N-7E	SESW	4077
25.5	-708	N/A	-96.573600	35.608992	VIERSEN & COCHRAN	HALL	N/A	N/A	Okfuskee	16-13N-7E	NWNWNE	4210

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
25.5	722	10700375.0	-96.577899	35.607201	UNIT OPERATIONS INC	COLLINS	N/A	N/A	Okfuskee	16-13N-7E	SWNENW	0
25.5	722	10700375.0	-96.577899	35.607201	TRANS-VIKING PETROLEUM INC	COLLINS	N/A	N/A	Okfuskee	16-13N-7E	SWNENW	4032
25.7	979	10701020.0	-96.577920	35.605377	WARREN IGLEHEART	COLLINS	N/A	N/A	Okfuskee	16-13N-7E	NWSENW	4201
25.7	979	10701020.0	-96.577920	35.605377	TRANS-VIKING PETROLEUM INC	COLLINS	N/A	N/A	Okfuskee	16-13N-7E	NWSENW	4201
25.7	797	N/A	-96.576808	35.604474	TRANS-VIKING PETROLEUM INC	COLLINS	N/A	N/A	Okfuskee	16-13N-7E	SENW	4235
25.8	-393	N/A	-96.572489	35.604474	AMERADA PETROLEUM CORP	BEAR ESTATE	N/A	N/A	Okfuskee	16-13N-7E	CTSWNE	4130
26.1	-78	10720211.0	-96.571378	35.599956	TURLEY OIL CO	MUNSON	N/A	N/A	Okfuskee	16-13N-7E	SENWSE	3722
26.2	-558	10720212.0	-96.569156	35.598998	TURLEY OIL CO	MUNSON	N/A	N/A	Okfuskee	16-13N-7E	NWSESE	3700
26.3	638	10730052.0	-96.572799	35.597596	TURLEY OIL CO	MOBIL A	N/A	N/A	Okfuskee	16-13N-7E	NWSWSE	3709
26.5	1049	N/A	-96.572401	35.593680	GREENLAND DRLG CO	HALL	N/A	N/A	Okfuskee	21-13N-7E	NWNWNE	3710
26.9	361	N/A	-96.567957	35.589163	FRED C SUMMERS	ALDRIDGE UNIT	N/A	N/A	Okfuskee	21-13N-7E	CTSWSENE	2842
27.2	478	N/A	-96.566341	35.585548	CAMEO OIL CO	KLABZUBA A	N/A	N/A	Okfuskee	21-13N-7E	SENESE	1163
27.2	656	10700945.0	-96.566846	35.585275	ANCHOR PETROLEUM CO	KLABZUBA	N/A	N/A	Okfuskee	21-13N-7E	SENESE	3210
27.2	656	10700945.0	-96.566846	35.585275	MORGAN & FRIEND	KLABZUBA	N/A	N/A	Okfuskee	21-13N-7E	SENESE	0
27.2	656	10700945.0	-96.566846	35.585275	CAMEO OIL CO	KLABZUBA	N/A	N/A	Okfuskee	21-13N-7E	SENESE	4152
27.5	100	10730090.0	-96.563263	35.581904	B B BLAIR	SNELL	N/A	N/A	Okfuskee	22-13N-7E	SHSWSW	3270
27.6	814	10730024.0	-96.564684	35.579533	B B BLAIR	KLUTTS	N/A	N/A	Okfuskee	27-13N-7E	NWNWNW	3295
27.7	-481	10730119.0	-96.560240	35.579985	B B BLAIR	WAGNER	N/A	N/A	Okfuskee	27-13N-7E	NWNENW	3268
27.9	1232	N/A	-96.564128	35.575016	B B BLAIR	FOLLANSBEE	N/A	N/A	Okfuskee	27-13N-7E	NESWSWNW	3249
28.0	198	10720037.0	-96.560240	35.574564	B B BLAIR	CASTLE	N/A	N/A	Okfuskee	27-13N-7E	SWSENW	3280
28.1	-1055	10721339.0	-96.555771	35.574564	BRISTOW RESOURCES INC	ELIAS	N/A	N/A	Okfuskee	27-13N-7E	SWSWNE	4330
28.1	-1150	10722631.0	-96.555434	35.574564	JAY PETROLEUM INC	OROURKE	N/A	N/A	Okfuskee	27-13N-7E	EHSWSWNE	4435
28.3	-1260	10700922.0	-96.553550	35.570950	YINGER PETROLEUM	BUTLER	N/A	N/A	Okfuskee	27-13N-7E	SENWSE	3800
28.3	-1260	10700922.0	-96.553550	35.570950	YINGER PETROLEUM	BUTLER	N/A	N/A	Okfuskee	27-13N-7E	SENWSE	3800
28.3	-1260	10700922.0	-96.553550	35.570950	SUMMIT DRLG CORP	BUTLER	N/A	N/A	Okfuskee	27-13N-7E	SENWSE	4250
28.4	-543	10721322.0	-96.555771	35.569143	TULSA PETROLEUM RESOURCES INC	ELIAS-ADAMS	N/A	N/A	Okfuskee	27-13N-7E	NWSWSE	4327
28.4	66	10721251.0	-96.558019	35.569143	TULSA PETROLEUM RESOURCES INC	ELIAS-ADAMS	N/A	N/A	Okfuskee	27-13N-7E	NESESW	4325

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
28.6	-914	N/A	-96.553550	35.567335	CAMEO OIL CO	CARNEY ADAMS A	N/A	N/A	Okfuskee	27-13N-7E	SESWSE	3725
28.8	-1221	10730022.0	-96.551373	35.565483	CAMEO OIL CO	CARNEY ADAMS	N/A	N/A	Okfuskee	34-13N-7E	NWNENE	4420
28.9	-332	10730098.0	-96.553594	35.563675	CAMEO OIL CO	CARNEY ADAMS	N/A	N/A	Okfuskee	34-13N-7E	SENWNE	3705
29.0	-685	N/A	-96.551373	35.561868	CAMEO OIL CO	CARNEY ADAMS	N/A	N/A	Okfuskee	34-13N-7E	NWSENE	3777
29.1	171	10730004.0	-96.553628	35.560143	CAMEO OIL CO	WILLIAMS	N/A	N/A	Okfuskee	34-13N-7E	SESWNE	3776
29.1	-1104	10700450.0	-96.549152	35.560006	CAMEO OIL CO	ADAMS	N/A	N/A	Okfuskee	34-13N-7E	SESENE	1569
29.1	-1104	10700450.0	-96.549152	35.560006	WOOD OIL CO	ADAMS	N/A	N/A	Okfuskee	34-13N-7E	SESENE	3810
29.1	-1104	10700450.0	-96.549152	35.560006	ANCHOR PRODUCTION CO	ADAMS	N/A	N/A	Okfuskee	34-13N-7E	SESENE	3280
29.2	-477	10720131.0	-96.551205	35.558254	CAMEO OIL CO	ANTHIS	N/A	N/A	Okfuskee	34-13N-7E	NWNESE	3720
29.3	-525	N/A	-96.551037	35.557980	CAMEO OIL CO	ANTHIS	N/A	N/A	Okfuskee	34-13N-7E	NWNESE	3830
29.4	246	10730094.0	-96.553595	35.556447	CAMEO OIL CO	LANGLEY	N/A	N/A	Okfuskee	34-13N-7E	SENWSE	3847
29.5	-404	10730112.0	-96.551373	35.554640	CAMEO OIL CO	PARKS	N/A	N/A	Okfuskee	34-13N-7E	NWSESE	3850
29.5	261	10730050.0	-96.553595	35.554229	CAMEO OIL CO	LANGLEY	N/A	N/A	Okfuskee	34-13N-7E	NWSWSE	3820
29.7	854	N/A	-96.555290	35.550340	SHAW-HUGHES	JENKINS	N/A	N/A	Okfuskee	3-12N-7E	NWNWNE	3822
30.0	-367	N/A	-96.548627	35.548081	J GARFIELD BUELL	WILLIAM LASLEY	N/A	N/A	Okfuskee	3-12N-7E	SENENE	3850
32.3	-1087	N/A	-96.530910	35.517646	J A ROBERSON ET AL	SUTHERLAND	N/A	N/A	Okfuskee	14-12N-7E	NESENE	3787
35.6	-923	N/A	-96.517562	35.472213	MIDSTATES OIL CORP	M K REPLOGLE	N/A	N/A	Okfuskee	36-12N-7E	SESWNE	3387
35.6	-124	N/A	-96.519744	35.470524	C E GRAGG	CURRY	N/A	N/A	Okfuskee	36-12N-7E	NWNWSE	4352
36.3	-1190	N/A	-96.513097	35.461429	VIERSEN & COCHRAN	MEYERS	N/A	N/A	Okfuskee	1-11N-7E	SENENE	4606
36.4	837	10721017.0	-96.519752	35.459621	HESTON OIL CO	ANTHIS	N/A	N/A	Okfuskee	1-11N-7E	CTNWSWNE	4414
37.2	1165	10722306.0	-96.517482	35.446795	K M T TX PETROLEUM CORP	SISTER	N/A	N/A	Okfuskee	12-11N-7E	SENWNE	3807
37.9	-353	N/A	-96.508703	35.439566	DEEP ROCK OIL CORP	D C CHASTAIN	N/A	N/A	Okfuskee	7-11N-8E	SENWSW	3693
37.9	-336	N/A	-96.508670	35.439361	DEEP ROCK OIL CORP	D C CHASTAIN	N/A	N/A	Okfuskee	7-11N-8E	SENWSW	4480
38.1	-1298	N/A	-96.504268	35.437759	D B MALERNEE	WHEELER	N/A	N/A	Okfuskee	7-11N-8E	NESESW	3675
38.3	869	10721383.0	-96.509719	35.433210	WHITMAR EXPL CO	WHITE HERON	N/A	N/A	Okfuskee	18-11N-8E	NWNW	4415
38.3	-785	N/A	-96.504174	35.434113	PHILLIPS PETROLEUM CO	DEERWESTER	N/A	N/A	Okfuskee	18-11N-8E	NENENW	3651
38.5	729	N/A	-96.508610	35.430499	MURPHY OIL CO OF OK INC	MAY	N/A	N/A	Okfuskee	18-11N-8E	NESWNW	3627
38.9	-281	N/A	-96.504175	35.426885	MCINTYRE-SHERMAN-CUMMINGS	GRAGG	N/A	N/A	Seminole	18-11N-8E	NENESW	3633

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
38.9	-265	13322955.0	-96.504151	35.426816	JERRY SCOTT DRLG CO INC	WILKINSON	N/A	N/A	Seminole	18-11N-8E	NENESW	2763
40.3	-607	13323761.0	-96.490973	35.408890	RESERVE EXPL CO	PRUETT	N/A	N/A	Seminole	20-11N-8E	CTNESWSW	4455
40.3	880	13300550.0	-96.495383	35.406970	MEALY-WOLFE DRLG CO	KENNEDY	N/A	N/A	Seminole	19-11N-8E	SESESE	3725
42.4	-1339	N/A	-96.477760	35.379871	PRAIRIE OIL & GAS CO	J W LESTER	N/A	N/A	Seminole	32-11N-8E	NESESE	3473
42.5	-1061	N/A	-96.478633	35.378940	HOME STAKE PRODUCTION CO	WILLIAMS	N/A	N/A	Seminole	32-11N-8E	CTSESE	3466
42.5	125	N/A	-96.482555	35.378063	PHILLIPS PETROLEUM CO	J W SARTIN	N/A	N/A	Seminole	32-11N-8E	SESWSE	4013
42.6	-1293	N/A	-96.477760	35.378063	PRAIRIE OIL & GAS CO	J W LESTER	N/A	N/A	Seminole	32-11N-8E	SESESE	3439
42.7	-540	N/A	-96.479992	35.376423	LAUREL OIL & GAS CO	SARTIN	N/A	N/A	Seminole	5-10N-8E	NWNENE	3445
42.7	131	N/A	-96.482208	35.376095	GYPSY OIL CO	EAST WILLIAMS	N/A	N/A	Seminole	5-10N-8E	NENWNE	3515
42.7	-515	N/A	-96.479992	35.376095	MAGNOLIA PETROLEUM CO	J F REMY	N/A	N/A	Seminole	5-10N-8E	NWNENE	3459
42.7	-1186	N/A	-96.477776	35.376423	LAUREL OIL & GAS CO	SARTIN	N/A	N/A	Seminole	5-10N-8E	NENENE	3500
42.7	-1158	13308609.0	-96.477776	35.376095	MAGNOLIA PETROLEUM CO	J F REMY	N/A	N/A	Seminole	5-10N-8E	NENENE	3421
42.7	-1158	13308609.0	-96.477776	35.376095	MAGNOLIA PETROLEUM CO	J F REMY	N/A	N/A	Seminole	5-10N-8E	NENENE	4200
42.7	932	N/A	-96.484424	35.374287	GYPSY OIL CO	EAST WILLIAMS	N/A	N/A	Seminole	5-10N-8E	SWNWNE	3484
42.8	-742	N/A	-96.478884	35.375191	HOME-STAKE PRODUCTION CO	MCCRARY-REMY UNIT	N/A	N/A	Seminole	5-10N-8E	CTNENE	3487
42.8	1138	N/A	-96.484424	35.372480	GYPSY OIL CO	M WISNER	N/A	N/A	Seminole	5-10N-8E	NWSWNE	3479
42.9	547	13321537.0	-96.482208	35.372480	JOHNSON-GIPSON OPERATING CO INC	GEORGE D PEEBLES	N/A	N/A	Seminole	5-10N-8E	NESWNE	4338
42.9	547	13321537.0	-96.482208	35.372480	C & C TANK TRUCK SERV INC	GEO D PEEBLES	N/A	N/A	Seminole	5-10N-8E	NESWNE	4338
42.9	1028	N/A	-96.483316	35.371421	HOME-STAKE PRODUCTION CO	FIXICO C	N/A	N/A	Seminole	5-10N-8E	CTSWNE	3504
42.9	24	N/A	-96.480429	35.372836	HOME-STAKE PRODUCTION CO	J F REMY	N/A	N/A	Seminole	5-10N-8E	NWSENE	3520
43.0	-644	N/A	-96.477776	35.372480	MAGNOLIA PETROLEUM CO	J F REMY	N/A	N/A	Seminole	5-10N-8E	NESENE	3444
43.0	-1259	N/A	-96.475622	35.372488	GYPSY OIL CO	BEN FIXICO	N/A	N/A	Seminole	4-10N-8E	NWSWNW	3445
43.0	813	N/A	-96.482208	35.370673	GYPSY OIL CO	M WISNER	N/A	N/A	Seminole	5-10N-8E	SESWNE	3454
43.0	181	N/A	-96.479992	35.370673	MAGNOLIA PETROLEUM CO	J E REMY	N/A	N/A	Seminole	5-10N-8E	SWSENE	3461
43.1	-1154	N/A	-96.475622	35.371503	GYPSY OIL CO	BEN FIXICO	N/A	N/A	Seminole	4-10N-8E	SWSWNW	3451
43.1	-451	N/A	-96.477776	35.370673	MAGNOLIA PETROLEUM CO	JNO F REMY	N/A	N/A	Seminole	5-10N-8E	SESENE	3585
43.1	1006	N/A	-96.482209	35.368866	GYPSY OIL CO	L N ALDRIDGE	N/A	N/A	Seminole	5-10N-8E	NENWSE	3487

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
43.2	373	N/A	-96.479993	35.368866	SINCLAIR OIL & GAS CO	BEN FIXICO	N/A	N/A	Seminole	5-10N-8E	NWNESE	3453
43.2	-260	N/A	-96.477777	35.368866	SINCLAIR OIL & GAS CO	BEN FIXICO	N/A	N/A	Seminole	5-10N-8E	NENESE	3468
43.2	-231	13323900.0	-96.477877	35.368866	HORSESHOE OIL CO	VONI	N/A	N/A	Seminole	5-10N-8E	NENESE	1990
43.2	-1261	N/A	-96.474447	35.369230	MID-CONTINENT PETROLEUM CORP	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	NENWSW	1765
43.2	-869	N/A	-96.475723	35.368956	COSDEN OIL & GAS CO	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	NWNWSW	3448
43.3	-1330	N/A	-96.474118	35.368127	MID-CONTINENT PETROLEUM CORP	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	NENWSW	1758
43.3	1100	N/A	-96.482209	35.367059	GYPSY OIL CO	ALDRIDGE	N/A	N/A	Seminole	5-10N-8E	SENWSE	3488
43.3	439	N/A	-96.479993	35.367059	SINCLAIR OIL & GAS CO	BEN FIXICO	N/A	N/A	Seminole	5-10N-8E	SWNESE	3459
43.3	-221	N/A	-96.477777	35.367059	SINCLAIR OIL & GAS CO	BEN FIXICO	N/A	N/A	Seminole	5-10N-8E	SENESE	3410
43.3	-221	N/A	-96.477777	35.367059	SINCLAIR OIL & GAS CO	BEN FIXICO	N/A	N/A	Seminole	5-10N-8E	SENESE	3452
43.3	-864	N/A	-96.475622	35.367067	COSDEN OIL & GAS CO	N JACKSON	N/A	N/A	Seminole	4-10N-8E	SWNWSW	3439
43.3	-1311	N/A	-96.474118	35.366966	MID-CONTINENT PETROLEUM CORP	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	SENWSW	1764
43.4	-469	13320007.0	-96.476904	35.366292	HOME-STAKE PRODUCTION CO	BEN FIXICO A	N/A	N/A	Seminole	5-10N-8E	SENESE	3550
43.4	756	N/A	-96.481000	35.366046	HOME-STAKE PRODUCTION CO	V SAMPSON	N/A	N/A	Seminole	5-10N-8E	SE	3585
43.4	490	N/A	-96.479993	35.365252	GYPSY OIL CO	VINA SAMPSON	N/A	N/A	Seminole	5-10N-8E	NWSESE	3475
43.4	-139	N/A	-96.477911	35.365526	GYPSY OIL CO	VINA SAMPSON	N/A	N/A	Seminole	5-10N-8E	NESESE	3439
43.4	-158	N/A	-96.477776	35.365252	GYPSY OIL CO	VINA SAMPSON	N/A	N/A	Seminole	5-10N-8E	NESESE	3447
43.5	283	N/A	-96.478885	35.364348	HOME-STAKE PRODUCTION CO	V SAMPSON	N/A	N/A	Seminole	5-10N-8E	CTSESE	3460
43.5	995	N/A	-96.480362	35.362678	HOME-STAKE PRODUCTION CO	V SAMPSON	N/A	N/A	Seminole	5-10N-8E	SWSESE	3464
43.5	275	N/A	-96.477777	35.363445	GYPSY OIL CO	VINA SAMPSON	N/A	N/A	Seminole	5-10N-8E	SESESE	3451
43.6	-646	N/A	-96.475602	35.365260	MID-CONTINENT PETROLEUM CORP	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	NWSWSW	3433
43.6	-146	N/A	-96.475622	35.363453	COSDEN OIL & GAS CO	NANCY JACKSON	N/A	N/A	Seminole	4-10N-8E	SWSWSW	3473
43.7	707	N/A	-96.477743	35.361577	GYPSY OIL CO	REPLOGEL	N/A	N/A	Seminole	8-10N-8E	NENENE	3460
43.8	950	N/A	-96.477743	35.359770	GULF OIL CORP	REPLOGLE	N/A	N/A	Seminole	8-10N-8E	SWNENE	0
43.8	950	N/A	-96.477743	35.359770	GYPSY OIL CO	REPLOGLE	N/A	N/A	Seminole	8-10N-8E	SENENE	3460
43.8	-1130	N/A	-96.471129	35.361599	CARTER OIL CO	B T HALL	N/A	N/A	Seminole	9-10N-8E	NWNENW	3535
43.9	342	N/A	-96.475560	35.359792	CARTER OIL CO	B T HALL	N/A	N/A	Seminole	9-10N-8E	SWNWNW	3483

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
43.9	-272	N/A	-96.473344	35.359792	CARTER OIL CO	B T HALL	N/A	N/A	Seminole	9-10N-8E	SENWNW	3489
44.0	-886	N/A	-96.471129	35.359792	GARDNER PETROLEUM CO	BRUNER	N/A	N/A	Seminole	9-10N-8E	SWNENW	3932
44.0	586	N/A	-96.475560	35.357985	CARTER OIL CO	ADAM STARR	N/A	N/A	Seminole	9-10N-8E	NWSWNW	3499
44.0	-29	N/A	-96.473344	35.357985	CARTER OIL CO	ADAM STARR	N/A	N/A	Seminole	9-10N-8E	NESWNW	3502
44.1	829	N/A	-96.475560	35.356178	AMERADA PETROLEUM CORP	H H ROGERS	N/A	N/A	Seminole	9-10N-8E	SESWNW	3502
44.1	829	N/A	-96.475560	35.356178	AMERADA PETROLEUM CORP	H H ROGERS	N/A	N/A	Seminole	9-10N-8E	SWSWNW	3461
44.2	-409	N/A	-96.471095	35.356178	CARTER OIL CO	ADAM STARR	N/A	N/A	Seminole	9-10N-8E	SWSENW	3483
44.2	1073	N/A	-96.475560	35.354370	SINCLAIR OIL & GAS CO	MASANER BUNNER	N/A	N/A	Seminole	9-10N-8E	NWNWSW	3480
44.2	-1016	N/A	-96.468913	35.356178	CARTER OIL CO	ADAM STARR	N/A	N/A	Seminole	9-10N-8E	SESENW	3459
44.2	54	13330236.0	-96.472304	35.355219	SALMON CORP	BAKER	N/A	N/A	Seminole	9-10N-8E	NENWSW	3505
44.3	444	N/A	-96.473345	35.354370	SINCLAIR OIL & GAS CO	MASANER BUNNER	N/A	N/A	Seminole	9-10N-8E	NENWSW	3465
44.3	-186	N/A	-96.471129	35.354370	GARDNER PETROLEUM CO	KIKER	N/A	N/A	Seminole	9-10N-8E	NWNESW	3464
44.3	858	N/A	-96.474452	35.353467	PURE OIL CO	D REPLOGLE	N/A	N/A	Seminole	9-10N-8E	CTNWSW	3463
44.3	-816	N/A	-96.468914	35.354370	GARDNER PETROLEUM CO	KIKER	N/A	N/A	Seminole	9-10N-8E	NENESW	3426
44.3	1273	N/A	-96.475560	35.352563	SINCLAIR OIL & GAS CO	MASANER BUNNER	N/A	N/A	Seminole	9-10N-8E	SWNWSW	3492
44.4	-402	13330134.0	-96.470021	35.353467	SALMON CORP	ROGERS-M C UNIT	N/A	N/A	Seminole	9-10N-8E	CTNESW	3442
44.4	643	13308647.0	-96.473345	35.352563	SINCLAIR OIL & GAS CO	MASANER BUNNER	N/A	N/A	Seminole	9-10N-8E	SENWSW	3487
44.4	-396	13324323.0	-96.470021	35.353409	ALTEX RESOURCES INC	ROGERS	N/A	N/A	Seminole	9-10N-8E	NHSHNESW	4245
44.4	13	N/A	-96.471129	35.352563	GARDNER PETROLEUM CO	BRUNER	N/A	N/A	Seminole	9-10N-8E	SWNESW	3484
44.5	-617	N/A	-96.468914	35.352563	GARDNER PETROLEUM CO	KIKER	N/A	N/A	Seminole	9-10N-8E	SENESW	3430
44.5	453	13330239.0	-96.472304	35.351605	SALMON CORP	BAKER	N/A	N/A	Seminole	9-10N-8E	NESWSW	3482
44.5	-1214	N/A	-96.466817	35.352563	PURE OIL CO	D REPLOGLE	N/A	N/A	Seminole	9-10N-8E	SWNWSE	3423
44.5	843	N/A	-96.473345	35.350756	SINCLAIR OIL & GAS CO	MASANER BUNNER	N/A	N/A	Seminole	9-10N-8E	NESWSW	3499
44.5	-789	13330235.0	-96.467940	35.351605	SALMON CORP	BAKER	N/A	N/A	Seminole	9-10N-8E	NESESW	3413
44.5	212	N/A	-96.471129	35.350756	GARDNER PETROLEUM CO	BRUNER	N/A	N/A	Seminole	9-10N-8E	NWSESW	3472
44.6	-426	N/A	-96.468914	35.350756	GARDNER PETROLEUM CO	BRUNER	N/A	N/A	Seminole	9-10N-8E	NESESW	3456
44.6	949	N/A	-96.473345	35.348949	SINCLAIR OIL & GAS CO	MASANER	N/A	N/A	Seminole	9-10N-8E	SESWSW	3486
44.7	344	N/A	-96.471129	35.348949	GARDNER PETROLEUM CO	BRUNER KIKER	N/A	N/A	Seminole	9-10N-8E	SWSESW	3473

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
44.7	-236	N/A	-96.468914	35.348949	GARDNER PETROLEUM CO	KIKER	N/A	N/A	Seminole	9-10N-8E	SESESW	3480
44.7	-837	13320482.0	-96.466817	35.349155	SESSIONS OIL CO	MID-CROMWELL UNIT	N/A	N/A	Seminole	9-10N-8E	SWSE	3498
44.7	-814	N/A	-96.466817	35.348949	PURE OIL CO	D REPLOGLE	N/A	N/A	Seminole	9-10N-8E	SWSWSE	3566
44.8	1248	N/A	-96.473315	35.347012	MCMAN OIL & GAS CO	L I BAKER	N/A	N/A	Seminole	16-10N-8E	NENWNW	3435
44.8	617	N/A	-96.471100	35.347012	GILLILAND OIL CO	SAM PROCTOR	N/A	N/A	Seminole	16-10N-8E	NWNENW	3485
44.8	617	N/A	-96.471100	35.347012	SUPERIOR OIL CORP	BAKER	N/A	N/A	Seminole	16-10N-8E	NWNENW	3465
44.8	28	N/A	-96.468884	35.347012	SUPERIOR OIL CORP	BAKER	N/A	N/A	Seminole	16-10N-8E	NENENW	3445
44.8	488	N/A	-96.469992	35.346109	ELSON OIL CO	BAKER	N/A	N/A	Seminole	16-10N-8E	CTNENW	3472
44.9	949	N/A	-96.471100	35.345205	SUPERIOR OIL CORP	L BAKER	N/A	N/A	Seminole	16-10N-8E	SWNENW	3420
44.9	-476	13303182.0	-96.466808	35.347012	GILLILAND OIL CO	SAM PROCTOR	N/A	N/A	Seminole	16-10N-8E	NWNWNE	3507
44.9	-476	13303182.0	-96.466808	35.347012	GILLILAND OIL CO	SAM PROCTOR	N/A	N/A	Seminole	16-10N-8E	NWNWNE	3458
44.9	1141	13320438.0	-96.471100	35.344302	RUSSELL B PATTERSON	FORE	N/A	N/A	Seminole	16-10N-8E	WHEHNW	3471
44.9	411	13320419.0	-96.468884	35.345205	RUSSELL B PATTERSON	FORE	N/A	N/A	Seminole	16-10N-8E	SENENW	3481
44.9	411	N/A	-96.468884	35.345205	CROMWELL OIL & GAS CO	RUBY HALL	N/A	N/A	Seminole	16-10N-8E	SENENW	3520
44.9	411	N/A	-96.468884	35.345205	SUPERIOR OIL CORP	BAKER	N/A	N/A	Seminole	16-10N-8E	SENENW	3491
45.0	-92	N/A	-96.466808	35.345205	GILLILAND OIL CO	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SWNWNE	3540
45.0	-683	N/A	-96.464593	35.345205	LIVINGSTON OIL CORP	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SENWNE	3532
45.1	53	13320408.0	-96.466808	35.344302	ELSON OIL CO	PROCTOR	N/A	N/A	Seminole	16-10N-8E	WHWHNE	3512
45.1	750	13390521.0	-96.468884	35.343398	CARTER OIL CO	L ROBERTS	N/A	N/A	Seminole	16-10N-8E	NESENW	3505
45.1	750	13390521.0	-96.468884	35.343398	EXXON CORP	L ROBERTS	N/A	N/A	Seminole	16-10N-8E	NESENW	3505
45.1	750	13390521.0	-96.468884	35.343398	COOK OIL CO	L ROBERTS	N/A	N/A	Seminole	16-10N-8E	NESENW	3505
45.1	-1297	13308716.0	-96.462377	35.345205	CARTER OIL CO	RUBY HALL	N/A	N/A	Seminole	16-10N-8E	SWNENE	3508
45.1	-1297	13308716.0	-96.462377	35.345205	CARTER OIL CO	RUBY HALL	N/A	N/A	Seminole	16-10N-8E	SWNENE	3523
45.1	175	N/A	-96.466808	35.343398	GILLILAND OIL CO	SAM PROCTOR	N/A	N/A	Seminole	16-10N-8E	NWSWNE	3514
45.1	-443	N/A	-96.464593	35.343398	GILLILAND OIL CO	SAM PROCTOR	N/A	N/A	Seminole	16-10N-8E	NESWNE	3507
45.2	-1085	N/A	-96.462377	35.343398	HOFFER OIL CORP	BOB BERRY	N/A	N/A	Seminole	16-10N-8E	NWSENE	3463
45.2	959	13300959.0	-96.468884	35.341591	CARTER OIL CO	L ROBERTS	N/A	N/A	Seminole	16-10N-8E	SESENW	3526
45.2	368	N/A	-96.466808	35.341591	GILLILAND OIL CO ET AL	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SWSWNE	3560
45.3	1204	N/A	-96.468885	35.339784	WAITE PHILLIPS CO	STELLA PROCTOR	N/A	N/A	Seminole	16-10N-8E	NENESW	3527

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
45.3	-190	N/A	-96.464760	35.341591	ELSON OIL CO	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SESWNE	3578
45.3	-232	13303180.0	-96.464593	35.341591	GILLILAND OIL CO ET AL	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SESWNE	3594
45.3	-232	13303180.0	-96.464593	35.341591	GILLILAND OIL CO & LIVINGSTON OIL CORP	PROCTOR	N/A	N/A	Seminole	16-10N-8E	SESWNE	3594
45.3	-808	N/A	-96.462377	35.341591	HOFFER OIL CORP	BOB BERRY	N/A	N/A	Seminole	16-10N-8E	SWSENE	3502
45.3	668	N/A	-96.466808	35.339784	AMERADA PETROLEUM CORP	C BRUNER	N/A	N/A	Seminole	16-10N-8E	NWNWSE	3572
45.4	68	N/A	-96.464593	35.339784	AMERADA PETROLEUM CORP	CAROLINA BRUNER	N/A	N/A	Seminole	16-10N-8E	NENWSE	3585
45.4	806	13300877.0	-96.466808	35.338880	LUBELL OIL CO	AMERADA	N/A	N/A	Seminole	16-10N-8E	WHNWSE	1990
45.4	806	13300877.0	-96.466808	35.338880	AMERADA PETROLEUM CORP	C BRUNER	N/A	N/A	Seminole	16-10N-8E	WHNWSE	3565
45.4	-533	N/A	-96.462378	35.339784	AMERADA PETROLEUM CORP	CAROLINE BRUNER	N/A	N/A	Seminole	16-10N-8E	NWNESE	3560
45.4	-533	N/A	-96.462378	35.339784	WAITE PHILLIPS CO	STELLA PROCTOR	N/A	N/A	Seminole	16-10N-8E	NWNESE	3516
45.5	943	N/A	-96.466808	35.337977	AMERADA PETROLEUM CORP	CAROLINE BRUNER	N/A	N/A	Seminole	16-10N-8E	SWNWSE	3552
45.5	-1174	13302756.0	-96.460062	35.339866	AMERADA PETROLEUM CORP	CAROLINE BRUNER	N/A	N/A	Seminole	16-10N-8E	NENESE	3559
45.5	-1174	13302756.0	-96.460062	35.339866	AMERADA PETROLEUM CORP	CAROLINE BRUNER	N/A	N/A	Seminole	16-10N-8E	NENESE	3526
45.5	342	N/A	-96.464593	35.337977	AMERADA PETROLEUM CORP	C BRUNER	N/A	N/A	Seminole	16-10N-8E	SENWSE	3573
45.6	-258	N/A	-96.462378	35.337977	AMERADA PETROLEUM CORP	CAROLINA BRUNER	N/A	N/A	Seminole	16-10N-8E	SWNESE	3611
45.6	-424	13324311.0	-96.461821	35.338075	ALTEX RESOURCES INC	HODGES	N/A	N/A	Seminole	16-10N-8E	SWNESE	4332
45.6	1218	N/A	-96.466808	35.336170	GYPSY OIL CO	HALE-BRUNER	N/A	N/A	Seminole	16-10N-8E	NWSWSE	3557
45.6	-872	N/A	-96.460163	35.338045	AMERADA PETROLEUM CORP	CAROLINE BRUNER	N/A	N/A	Seminole	16-10N-8E	SENESE	3558
45.6	-862	N/A	-96.460163	35.337977	AMERADA PETROLEUM CORP	C BRUNER	N/A	N/A	Seminole	16-10N-8E	SENESE	1060
45.6	613	N/A	-96.464593	35.336170	GYPSY OIL CO	HALE-BRUNER	N/A	N/A	Seminole	16-10N-8E	NESWSE	3571
45.6	777	N/A	-96.465063	35.335923	HOME-STAKE PRODUCTION CO	HALE BRUNER	N/A	N/A	Seminole	16-10N-8E	SWSE	3619
45.7	-600	N/A	-96.460163	35.336170	GYPSY OIL CO	HALE BRUNER	N/A	N/A	Seminole	16-10N-8E	NESESE	3566
45.7	876	N/A	-96.464593	35.334362	GYPSY OIL CO	HALE BRUNER	N/A	N/A	Seminole	16-10N-8E	SESWSE	3570
45.8	-1205	N/A	-96.457954	35.336170	H F WILCOX OIL & GAS CO	PEARLY BRUNER	N/A	N/A	Seminole	15-10N-8E	NWSWSW	3550
45.8	-469	13324291.0	-96.460163	35.335266	TRIPOWER RESOURCES INC	BAILEY	N/A	N/A	Seminole	16-10N-8E	CTEHSESE	3645
45.8	268	N/A	-96.462378	35.334362	GYPSY OIL CO	HALE-BRUNER	N/A	N/A	Seminole	16-10N-8E	SWSESE	3552

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
45.8	920	N/A	-96.464049	35.333016	HOME-STAKE PRODUCTION CO	MANDY HARJO A	N/A	N/A	Seminole	21-10N-8E	NE	3595
45.8	-340	N/A	-96.460163	35.334362	GYPSY OIL CO	HALE BRUNER	N/A	N/A	Seminole	16-10N-8E	SESESE	3537
45.8	1117	N/A	-96.464553	35.332606	INDEPENDENT OIL & GAS CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	NENWNE	3557
45.9	-1127	N/A	-96.457434	35.334623	HOME-STAKE PRODUCTION CO	P BRUNER	N/A	N/A	Seminole	15-10N-8E	SW	3540
45.9	-946	N/A	-96.457954	35.334362	H F WILCOX OIL & GAS CO	PEARLY BRUNER	N/A	N/A	Seminole	15-10N-8E	SWSWSW	3479
45.9	508	N/A	-96.462338	35.332606	TIDAL OIL & TIDAL OSAGE CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	NWNENE	3522
45.9	-1288	13324221.0	-96.456712	35.334362	MONTGOMERY EXPL CO LTD	EAGLE	N/A	N/A	Seminole	15-10N-8E	WHSESWSW	3607
45.9	-1288	13324221.0	-96.456712	35.334362	TRIPOWER RESOURCES INC	EAGLE	N/A	N/A	Seminole	15-10N-8E	WHSESWSW	0
45.9	-332	N/A	-96.459519	35.333071	HOME-STAKE PRODUCTION CO	MANDY HARJO A	N/A	N/A	Seminole	21-10N-8E	NE	3548
45.9	1083	13324371.0	-96.463848	35.331483	TRIPOWER RESOURCES INC	DOUGLAS	N/A	N/A	Seminole	21-10N-8E	NESENWNE	3700
45.9	-110	N/A	-96.460123	35.332679	COSDEN OIL & GAS CO	GRANVILLE SIMON	N/A	N/A	Seminole	21-10N-8E	NENENE	3314
45.9	-100	13370351.0	-96.460123	35.332606	CLAYBROOK DRLG CO	HARJO	N/A	N/A	Seminole	21-10N-8E	NENENE	3387
45.9	-100	N/A	-96.460123	35.332606	TIDAL OIL & TIDAL OSAGE JOINT	H HARJO	N/A	N/A	Seminole	21-10N-8E	NENENE	3760
45.9	-100	N/A	-96.460123	35.332606	BOBBY C WILSON & CO	HARJO	N/A	N/A	Seminole	21-10N-8E	NENENE	3387
46.0	458	N/A	-96.461700	35.331729	HOME-STAKE PRODUCTION CO	MANDY HARJO A	N/A	N/A	Seminole	21-10N-8E	NE	3505
46.0	333	13324331.0	-96.461230	35.331702	TRIPOWER RESOURCES INC	DOUGLAS	N/A	N/A	Seminole	21-10N-8E	CTNENE	3650
46.0	1197	N/A	-96.463445	35.330059	HOME-STAKE PRODUCTION CO	MANDY HARJO A	N/A	N/A	Seminole	21-10N-8E	NE	3600
46.0	775	N/A	-96.462338	35.330798	TIDAL OIL & TIDAL OSAGE CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	SWNENE	3571
46.0	554	13324332.0	-96.461549	35.330908	ALTEX RESOURCES INC	DOUGLAS	N/A	N/A	Seminole	21-10N-8E	NESWNENE	4306
46.0	554	13324332.0	-96.461549	35.330908	TRIPOWER RESOURCES INC	DOUGLAS	N/A	N/A	Seminole	21-10N-8E	NESWNENE	4306
46.0	1209	13323342.0	-96.462338	35.328991	CLAYBROOK DRLG CO	ROMAN	N/A	N/A	Seminole	21-10N-8E	NWSENE	3589
46.0	1209	N/A	-96.462338	35.328991	CLAYBROOK DRLG CO	ROMAN	N/A	N/A	Seminole	21-10N-8E	NWSENE	3589
46.0	1209	N/A	-96.462338	35.328991	TIDAL OIL & OSAGE CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	NWSENE	3243
46.0	1209	13323342.0	-96.462338	35.328991	CLAYBROOK DRLG CO	ROMAN	N/A	N/A	Seminole	21-10N-8E	NWSENE	3589
46.0	288	N/A	-96.460123	35.330798	TIDAL OIL CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	SENENE	3486
46.0	912	13324394.0	-96.461230	35.329347	TRIPOWER RESOURCES INC	DOUGLAS	N/A	N/A	Seminole	21-10N-8E	NHNHSENE	3609

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
46.1	410	N/A	-96.459317	35.330169	HOME-STAKE PRODUCTION CO	MANDY HARJO A	N/A	N/A	Seminole	21-10N-8E	SENENE	3503
46.1	-588	N/A	-96.457947	35.332672	SHAFFER OIL & REFINING CO	W YAHOLA	N/A	N/A	Seminole	22-10N-8E	NWNWNW	3504
46.1	-596	13324203.0	-96.457487	35.332548	MONTGOMERY EXPL CO LTD	WOLFE	N/A	N/A	Seminole	22-10N-8E	SENWNWNW	3590
46.1	-928	N/A	-96.455732	35.332672	SHAFFER OIL & REFINING CO	W YAHOLA	N/A	N/A	Seminole	22-10N-8E	NENWNW	3456
46.1	-5	13302762.0	-96.457947	35.330864	SHAFFER OIL & REFINING CO	YAHOLA	N/A	N/A	Seminole	22-10N-8E	SWNWNW	3425
46.1	-5	13302762.0	-96.457947	35.330864	SHAFFER OIL & REFINING CO	W YAHOLA	N/A	N/A	Seminole	22-10N-8E	SWNWNW	3485
46.2	-643	N/A	-96.455732	35.330864	SHAFFER OIL & REFINING CO	YAHOLA	N/A	N/A	Seminole	22-10N-8E	SENWNW	3480
46.2	-1296	N/A	-96.453517	35.330864	SHAFFER OIL & REFINING CO	YAHOLA	N/A	N/A	Seminole	22-10N-8E	SWNENW	3486
46.3	689	N/A	-96.460123	35.328991	TIDAL OIL & TIDAL OSAGE OIL CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	NESENE	3463
46.3	68	N/A	-96.458048	35.329139	MCMAN OIL & GAS CO	M E HOLMES	N/A	N/A	Seminole	22-10N-8E	NWSWNW	3443
46.3	992	N/A	-96.460995	35.328334	HOME-STAKE PRODUCTION CO	MANDY HARJO B	N/A	N/A	Seminole	21-10N-8E	NE	3530
46.3	964	N/A	-96.460123	35.327102	TIDAL OIL & TIDAL OSAGE CO	H HARJO	N/A	N/A	Seminole	21-10N-8E	SESENE	3477
46.3	-353	13324344.0	-96.456437	35.329139	TRIPOWER RESOURCES INC	JACQUE	N/A	N/A	Seminole	22-10N-8E	NWNESWNW	3594
46.3	-529	N/A	-96.455631	35.329139	MCMAN OIL & GAS CO	M E HOLMES	N/A	N/A	Seminole	22-10N-8E	NESWNW	3436
46.4	461	N/A	-96.458048	35.327168	MCMAN OIL & GAS CO	M E HOLMES	N/A	N/A	Seminole	22-10N-8E	SWSWNW	3453
46.4	270	13320602.0	-96.457393	35.327250	BRADLEY & HOLMES	HOLMES	N/A	N/A	Seminole	22-10N-8E	CTSHSWNW	1799
46.4	-112	N/A	-96.456205	35.327636	HOME-STAKE PRODUCTION CO	HOLMES	N/A	N/A	Seminole	22-10N-8E	SESWNW	3500
46.4	776	N/A	-96.457947	35.325443	SAVOY OIL CO	L DEER	N/A	N/A	Seminole	22-10N-8E	NWNWSW	3470
46.5	-45	N/A	-96.455631	35.327031	MCMAN OIL & GAS CO	M E HOLMES	N/A	N/A	Seminole	22-10N-8E	SESWNW	3456
46.5	-988	N/A	-96.453517	35.329057	COSDEN OIL & GAS CO	WILSON KING	N/A	N/A	Seminole	22-10N-8E	NWSENW	3461
46.5	-919	N/A	-96.452409	35.327880	HOME-STAKE PRODUCTION CO	HOLMES UNIT	N/A	N/A	Seminole	22-10N-8E	SENW	3485
46.5	-517	N/A	-96.453517	35.327250	COSDEN OIL & GAS CO	WILSON KING	N/A	N/A	Seminole	22-10N-8E	SWSENW	3451
46.5	335	13322272.0	-96.455598	35.325553	CASCO PRODUCTION INC	ALLENSWORTH	N/A	N/A	Seminole	22-10N-8E	NENWSW	0
46.5	390	N/A	-96.455732	35.325443	SAVOY OIL CO	LINDA DEER	N/A	N/A	Seminole	22-10N-8E	NENWSW	3462
46.6	843	N/A	-96.456840	35.324540	R G BEACH	DEER	N/A	N/A	Seminole	22-10N-8E	CTNWSW	3457
46.7	731	N/A	-96.455732	35.323636	SAVOY OIL CO	L DEER	N/A	N/A	Seminole	22-10N-8E	SENWSW	3542

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
46.7	109	N/A	-96.453517	35.323636	CARTER OIL CO	L YAHOLA	N/A	N/A	Seminole	22-10N-8E	SWNESW	1510
46.8	-535	N/A	-96.451303	35.323636	H O HELVIE	L YAHOLA	N/A	N/A	Seminole	22-10N-8E	NWNESW	3449
47.5	-534	N/A	-96.449064	35.312750	RUSSELL MAGUIRE	MAXEY ARAHLOKOCHE	N/A	N/A	Seminole	27-10N-8E	SWSWNE	4495
48.1	953	N/A	-96.453486	35.303648	SIMPSON-FELL OIL CO ET AL	REPLOGLE	N/A	N/A	Seminole	34-10N-8E	NWNENW	3555
48.6	-266	13300400.0	-96.449068	35.296420	HALL & TROUP-MOORE	ALDRIDGE	N/A	N/A	Seminole	34-10N-8E	NWNWSE	3301
48.8	-980	13322574.0	-96.446620	35.294161	SENTINEL PETROLEUM INC	WADKINS	N/A	N/A	Seminole	34-10N-8E	SESENWSE	2069
48.8	-980	13322574.0	-96.446620	35.294161	SENTINEL PETROLEUM INC	WADKINS	N/A	N/A	Seminole	34-10N-8E	SESENWSE	2069
48.9	-75	13323440.0	-96.449622	35.292354	SENTINEL PETROLEUM INC	PERKINS	N/A	N/A	Seminole	34-10N-8E	NWSWSE	2087
48.9	-75	13323440.0	-96.449622	35.292354	SENTINEL PETROLEUM INC	PERKINS	N/A	N/A	Seminole	34-10N-8E	NWSWSE	2087
49.0	-569	13322261.0	-96.447961	35.291902	SENTINEL PETROLEUM INC	PERKINS	N/A	N/A	Seminole	34-10N-8E	SWSE	4230
49.0	260	13322341.0	-96.450719	35.290547	SENTINEL PETROLEUM INC	DEER	N/A	N/A	Seminole	34-10N-8E	SESESESW	2079
49.1	516	13323418.0	-96.451508	35.289495	AGATE PETROLEUM INC	LISA	N/A	N/A	Seminole	3-9N-8E	NENENW	2066
49.1	-79	13323495.0	-96.449513	35.289495	KLABZUBA ROYALTY CO	FOUNDATION	N/A	N/A	Seminole	3-9N-8E	NWNWNWN E	2100
49.2	-895	13324028.0	-96.446746	35.289043	LITTLE RIVER ENERGY CO	PERKINS	N/A	N/A	Seminole	3-9N-8E	NENWNE	2030
49.2	647	13322720.0	-96.451843	35.287976	SENTINEL PETROLEUM INC	HEWGLEY	N/A	N/A	Seminole	3-9N-8E	EHNENW	2097
49.7	-89	13300542.0	-96.448960	35.281815	WRIGHTSMAN OIL CO & RUSSELL B PATTERSON	BUTNER	N/A	N/A	Seminole	3-9N-8E	NWNWSE	3546
50.0	959	13307967.0	-96.451274	35.276394	BLACKWELL OIL & GAS CO	PORTER	N/A	N/A	Seminole	3-9N-8E	SESESW	3381
50.0	269	N/A	-96.448960	35.276394	EMPIRE OIL & REFINING CO	BUTNER	N/A	N/A	Seminole	3-9N-8E	SWSWSE	3560
50.0	269	13322457.0	-96.448960	35.276394	PARKINSOL OIL CO	SARAH	N/A	N/A	Seminole	3-9N-8E	SWSWSE	4354
50.0	269	13322457.0	-96.448960	35.276394	RAMHEAD PETROLEUM INC	SARAH	N/A	N/A	Seminole	3-9N-8E	SWSWSE	4400
50.2	971	13320365.0	-96.451198	35.274526	FRANK A KING	ABLE	N/A	N/A	Seminole	10-9N-8E	NWNENW	3710
50.2	302	N/A	-96.448958	35.274526	MCINTYRE-SHERMAN-CUMMINGS	DEARMAN	N/A	N/A	Seminole	10-9N-8E	NWNWNE	1632
50.2	1182	13308047.0	-96.451869	35.273923	TEXAS CO	H I BRINSFIELD	N/A	N/A	Seminole	10-9N-8E	NENENW	4356
50.5	-531	13301670.0	-96.446477	35.269104	HOWARD L BERKEY	ABEL	N/A	N/A	Seminole	10-9N-8E	SESWNE	4400
50.5	-531	13301670.0	-96.446477	35.269104	HOWARD L BERKEY	ABEL	N/A	N/A	Seminole	10-9N-8E	SESWNE	0
50.5	-15	13308046.0	-96.447852	35.269967	PRAIRIE OIL & GAS CO	NETTIE ABEL	N/A	N/A	Seminole	10-9N-8E	CTSWNE	4413
50.6	820	13308039.0	-96.451198	35.269104	HOWARD L BERKEY	HARVEY ABEL	N/A	N/A	Seminole	10-9N-8E	SESENW	3095
50.6	152	13322174.0	-96.448958	35.269104	RAMHEAD PETROLEUM INC	REED	N/A	N/A	Seminole	10-9N-8E	CTSWSWNE	4415

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
50.6	152	13322174.0	-96.448958	35.269104	RAMHEAD PETROLEUM INC	REED	N/A	N/A	Seminole	10-9N-8E	CTSWSWNE	4415
50.7	853	ZZ022747	-96.451199	35.267297	W A DELANEY JR	ABEL	N/A	N/A	Seminole	10-9N-8E	NENESW	3045
50.7	853	13322348.0	-96.451199	35.267297	RAMHEAD PETROLEUM INC	RICHARD	N/A	N/A	Seminole	10-9N-8E	CTNENESW	4405
50.7	853	13322348.0	-96.451199	35.267297	RAMHEAD PETROLEUM	RICHARD	N/A	N/A	Seminole	10-9N-8E	CTNENESW	4405
50.7	184	13322447.0	-96.448958	35.267297	RAMHEAD PETROLEUM INC	TRECIA	N/A	N/A	Seminole	10-9N-8E	CTNWNWSE	4394
50.7	-1137	13322997.0	-96.444532	35.267297	SCORPIO PETROLEUM INV INC	WISE	N/A	N/A	Seminole	10-9N-8E	NWNESE	4440
50.8	-1104	13308042.0	-96.444532	35.265490	CHRISTIE-STEWART DRLG CO	RUTHERFORD	N/A	N/A	Seminole	10-9N-8E	SWNESE	1915
51.0	-1072	13322735.0	-96.444532	35.263683	RAMHEAD PETROLEUM INC	CHAMBERS	N/A	N/A	Seminole	10-9N-8E	NWSESE	4400
51.2	985	13308049.0	-96.451219	35.259891	PRAIRIE OIL & GAS CO	MINNIE POLK	N/A	N/A	Seminole	15-9N-8E	NENENW	4577
51.3	-618	13321043.0	-96.445888	35.258549	COOK BROTHERS	BELFORD	N/A	N/A	Seminole	15-9N-8E	SENWNE	1627
51.3	-656	13308050.0	-96.445770	35.258221	SANDS INDUSTRIES INC	BELFORD-ABELS	N/A	N/A	Seminole	15-9N-8E	SENWNE	1640
51.5	-406	13308051.0	-96.446659	35.256277	STRICKLAND & OWENS	STEPHENS	N/A	N/A	Seminole	15-9N-8E	NESWNE	1625
51.5	-406	13308051.0	-96.446659	35.256277	H H BEVELHYMER	STEPHENS	N/A	N/A	Seminole	15-9N-8E	NESWNE	0
51.7	927	N/A	-96.451219	35.252663	INDEPENDENT OIL & GAS CO	D AHAISSE	N/A	N/A	Seminole	15-9N-8E	NENESW	3619
52.1	1247	13324201.0	-96.452436	35.247222	TEXAKOMA OIL & GAS CORP	TEXAKOMA-BUTNER	N/A	N/A	Seminole	15-9N-8E	SESWSESW	4341
52.2	86	13324231.0	-96.448602	35.245452	TEXAKOMA OIL & GAS CORP	TEXAKOMA-STAFFORD	N/A	N/A	Seminole	22-9N-8E	EHNWNWNE	4393
52.3	851	13301676.0	-96.451220	35.243559	MCINTYRE-SHERMAN-CUMMINGS	OKEY	N/A	N/A	Seminole	22-9N-8E	SENENW	4370
52.6	-543	13300142.0	-96.446658	35.239945	MID-CONTINENT PETROLEUM CORP	J C OKEY	N/A	N/A	Seminole	22-9N-8E	SESWNE	3540
52.9	-1252	13321984.0	-96.444446	35.234524	GARLAND MERRELL JR	STAFFORD	N/A	N/A	Seminole	22-9N-8E	NWSESE	4288
53.1	616	N/A	-96.450751	35.232717	JARVIS & HOLM INC	EMMA WILLIAMS	N/A	N/A	Seminole	22-9N-8E	SESESW	4412
53.1	757	N/A	-96.451221	35.232717	JARVIS & HOLM INC	E WILLIAMS	N/A	N/A	Seminole	22-9N-8E	SESESW	3035
53.1	757	N/A	-96.451221	35.232717	JARVIS & HOLM INC	E WILLIAMS	N/A	N/A	Seminole	22-9N-8E	SESESW	560
53.7	-584	13320884.0	-96.446721	35.223681	HOWARD ALEXANDER	ROGERS	N/A	N/A	Seminole	27-9N-8E	NENWSE	3927
54.1	83	13322990.0	-96.448933	35.218260	GOMACO INC	ROGERS	N/A	N/A	Seminole	27-9N-8E	CTSWSWSE	4478
54.1	83	13322990.0	-96.448933	35.218260	HILL OIL CO INC (GOMACO INC)	ROGERS	N/A	N/A	Seminole	27-9N-8E	CTSWSWSE	4478
54.2	-577	13300287.0	-96.446716	35.216393	PASQUELLA & LANE	THELMA JOHNSON	N/A	N/A	Seminole	34-9N-8E	NENWNE	4429
54.2	-577	13300287.0	-96.446716	35.216393	LANDERS & MUSGROVE	DAVIS-JOHNSON-FORESEE	N/A	N/A	Seminole	34-9N-8E	NENWNE	0

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
54.5	-1234	13323059.0	-96.444504	35.212779	HILL OIL CO INC	FLINT	N/A	N/A	Seminole	34-9N-8E	NWSENE	4372
54.7	-1207	13324396.0	-96.444504	35.209165	UNITED TX PETROLEUM INC	BLUEBONNET	N/A	N/A	Seminole	34-9N-8E	NWNESE	4400
55.0	171	N/A	-96.448928	35.205550	GLOBE OIL & REFINING CO	CHUPCO	N/A	N/A	Seminole	34-9N-8E	NWSWSE	3443
55.4	971	13302636.0	-96.451235	35.198376	BYRD OIL CORP-FORDEE RHOADES OIL CO	LOUIS BENDEN	N/A	N/A	Seminole	3-8N-8E	NESENW	3439
55.5	-383	13301139.0	-96.446701	35.198376	VAN DEVENTER MO	HARROD	N/A	N/A	Seminole	3-8N-8E	NESWNE	0
55.6	999	13320587.0	-96.451235	35.196569	HEMSTEAD OIL CORP	HARPER	N/A	N/A	Seminole	3-8N-8E	SESENW	4430
55.6	305	13310405.0	-96.448912	35.196569	MARADUN OIL CO	HARROD	N/A	N/A	Seminole	3-8N-8E	SWSWNE	3457
55.7	333	13311665.0	-96.448912	35.194762	VANDEVENTER MON	BAXTER	N/A	N/A	Seminole	3-8N-8E	NWNWSE	0
56.5	662	13321109.0	-96.448500	35.182907	KWB OIL PROP MGMT INC	SAYRE	N/A	N/A	Seminole	10-8N-8E	CTSWNE	3490
56.7	896	13300245.0	-96.448869	35.180196	R OLSEN OIL CO	B F DAVIS	N/A	N/A	Seminole	10-8N-8E	NWNWSE	4325
56.8	-315	13300038.0	-96.444447	35.178389	J A LIGON & SONS OIL CO	DAVIS	N/A	N/A	Seminole	10-8N-8E	SWNESE	3448
57.2	-678	13300272.0	-96.441867	35.173022	J A LIGON & SONS OIL CO	CHUPCO	N/A	N/A	Seminole	15-8N-8E	NENENE	4399
57.7	292	N/A	-96.444447	35.165711	TROUTMAN THOMPSON ET AL	SAMOCHE	N/A	N/A	Seminole	15-8N-8E	NWNESE	4094
58.0	541	13300886.0	-96.444447	35.162097	JORDAN PETROLEUM CO	CHAMBLEE	N/A	N/A	Seminole	15-8N-8E	NWSESE	4270
58.0	541	13300886.0	-96.444447	35.162097	OWEN H RIVES	CHAMBLEE	N/A	N/A	Seminole	15-8N-8E	NWSESE	2317
58.1	1166	13324242.0	-96.446657	35.160290	KEENER OIL & GAS CO	CHESSER	N/A	N/A	Seminole	15-8N-8E	SESWSE	3410
58.5	527	13308890.0	-96.444476	35.154863	MAGNOLIA PETROLEUM CO	W K HOLIWELL	N/A	N/A	Seminole	22-8N-8E	NWSENE	4221
58.7	1068	13322095.0	-96.446687	35.153056	PETROLEUM RESOURCES CO	SMART	N/A	N/A	Seminole	22-8N-8E	SESWNE	4300
59.1	-1001	6320185.0	-96.437861	35.149442	BILL LIGON DRLG CO	FGM	N/A	N/A	Hughes	23-8N-8E	SENWSW	4215
59.1	-1001	6320185.0	-96.437861	35.149442	FARMERS ENERGY CORP	F G M	N/A	N/A	Hughes	23-8N-8E	SENWSW	0
59.1	-1001	6320185.0	-96.437861	35.149442	LEWIS JOEL MILNE	F G M	N/A	N/A	Hughes	23-8N-8E	SENWSW	4215
59.2	653	13308892.0	-96.442267	35.145827	PRAIRIE OIL & GAS CO	AMY GARMAN	N/A	N/A	Hughes	22-8N-8E	SESESE	3575
59.3	182	N/A	-96.440184	35.143939	CLARK C NYE	GODFREY	N/A	N/A	Hughes	26-8N-8E	NWNWNW	3304
59.4	-59	6300406.0	-96.439079	35.143035	A GUTOWSKY	GODFREY	N/A	N/A	Hughes	26-8N-8E	NWNW	4329
59.4	-59	6300406.0	-96.439079	35.143035	CLARK C NYE	GUTOWSKY-GODFREY	N/A	N/A	Hughes	26-8N-8E	NWNW	0
59.6	499	6302208.0	-96.440184	35.140324	CLARK C NYE	GODFREY B	N/A	N/A	Hughes	26-8N-8E	NWSWNW	3275
59.7	440	N/A	-96.440184	35.138517	CLARK C NYE	GODFREY	N/A	N/A	Hughes	26-8N-8E	SWSWNW	3261
59.8	1049	13311690.0	-96.442266	35.138517	CLARK C NYE	GIDNEY	N/A	N/A	Hughes	27-8N-8E	SESENE	3246

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
59.8	536	6322024.0	-96.440184	35.136710	OWEN H RIVES	MCADAMS	N/A	N/A	Hughes	26-8N-8E	NWNWSW	3300
59.8	546	N/A	-96.440184	35.136655	CLARK C NYE	MUNSON	N/A	N/A	Hughes	26-8N-8E	NWNWSW	3267
59.9	-597	6321975.0	-96.435765	35.136710	OWEN H RIVES	MCADAMS	N/A	N/A	Hughes	26-8N-8E	NWNESW	3350
60.0	254	N/A	-96.437975	35.134903	B B BLAIR	MUNSON	N/A	N/A	Hughes	26-8N-8E	SENWSW	3231
60.0	-1067	6320898.0	-96.433555	35.134876	COTTONWOOD PETROLEUM CO	ROGERS	N/A	N/A	Hughes	26-8N-8E	SENESW	4268
60.0	-1056	6323199.0	-96.434108	35.132644	LYNAN ENERGY INC	MKB	N/A	N/A	Hughes	26-8N-8E	NESESW	3150
60.1	-752	6323120.0	-96.435765	35.132192	LYNAN ENERGY INC	MKB	N/A	N/A	Hughes	26-8N-8E	WHSESW	4331
60.2	518	6300202.0	-96.440184	35.133096	JERGINS OIL CO	TOCHE LOWE	N/A	N/A	Hughes	26-8N-8E	NWSWSW	4208
60.2	518	6321209.0	-96.440184	35.133096	OWEN H RIVES	LOWE	N/A	N/A	Hughes	26-8N-8E	NWSWSW	3379
60.3	306	6321009.0	-96.440184	35.131289	OWEN H RIVES	KEESEE	N/A	N/A	Hughes	26-8N-8E	SWSWSW	3397
60.4	374	6320944.0	-96.440309	35.129312	OWEN H RIVES	MUDD	N/A	N/A	Hughes	35-8N-8E	NWNWNW	3400
60.4	-279	6320346.0	-96.438100	35.129312	GOMACO INC	MUDD	N/A	N/A	Hughes	35-8N-8E	NENWNW	4281
60.4	-279	6320346.0	-96.438100	35.129312	OWEN H RIVES	MUDD	N/A	N/A	Hughes	35-8N-8E	NENWNW	3400
60.4	-279	6320346.0	-96.438100	35.129312	OWEN H RIVES	MUDD	N/A	N/A	Hughes	35-8N-8E	NENWNW	0
60.4	1041	13321122.0	-96.442394	35.128420	JERRY SCOTT DRLG CO INC	PAR RIVES	N/A	N/A	Hughes	34-8N-8E	EHNENE	4204
60.5	-176	N/A	-96.438100	35.127505	J W MCCULLOCH	C JEFFERSON	N/A	N/A	Hughes	35-8N-8E	CTSENWNW	3242
60.6	-829	N/A	-96.435890	35.127505	ROXANA PETROLEUM CORP	C BULLING	N/A	N/A	Hughes	35-8N-8E	CTSWNENW	3223
60.6	-829	N/A	-96.435890	35.127505	ROXANA PETROLEUM CORP	C BULLING	N/A	N/A	Hughes	35-8N-8E	CTSWNENW	3334
60.6	-451	N/A	-96.436995	35.126601	GYPSY OIL CO	MAHALA PROCTOR	N/A	N/A	Hughes	35-8N-8E	CTNW	3268
60.7	-73	6303090.0	-96.438100	35.125698	GYPSY OIL CO	E JEFFERSON	N/A	N/A	Hughes	35-8N-8E	CTNESWNW	3226
60.7	-73	6303090.0	-96.438100	35.125698	GYPSY OIL CO	C JEFFERSON	N/A	N/A	Hughes	35-8N-8E	CTNESWNW	4212
60.7	-726	N/A	-96.435890	35.125698	INDEPENDENT OIL & GAS CO	G JEFFERSON	N/A	N/A	Hughes	35-8N-8E	NWSENW	3226
60.7	-675	N/A	-96.435890	35.124794	WASSON OIL CO FOR J M CORBET ET AL	BULLING	N/A	N/A	Hughes	35-8N-8E	CTWHSENW	2037
60.8	28	N/A	-96.438100	35.123891	GYPSY OIL CO	C JEFFERSON	N/A	N/A	Hughes	35-8N-8E	CTSHNW	3263
60.8	-625	6302225.0	-96.435890	35.123891	INDEPENDENT OIL & GAS CO	GEO JEFFERSON	N/A	N/A	Hughes	35-8N-8E	SWSENW	3222
60.8	-625	N/A	-96.435890	35.123891	JENNINGS & CLOGG	BULLING	N/A	N/A	Hughes	35-8N-8E	SWSENW	1041
60.8	-625	6302225.0	-96.435890	35.123891	INDEPENDENT OIL & GAS CO	GEORGE JEFFERSON	N/A	N/A	Hughes	35-8N-8E	SWSENW	3277

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
60.8	-1291	N/A	-96.433681	35.124110	MIDSTATES OIL CORP	OTTO BULLING	N/A	N/A	Hughes	35-8N-8E	SESENW	2817
60.8	-1279	N/A	-96.433681	35.123891	INDEPENDENT OIL & GAS CO	G JEFFERSON	N/A	N/A	Hughes	35-8N-8E	SESENW	3270
60.8	-1275	N/A	-96.433681	35.123822	JENNINGS & CLOGG	BULLING	N/A	N/A	Hughes	35-8N-8E	SESENW	2817
60.9	127	6321971.0	-96.438100	35.122083	T F HODGE	MUDD	N/A	N/A	Hughes	35-8N-8E	CTNENWSW	4366
60.9	-526	N/A	-96.435891	35.122083	JOHNSON & ASHE	BUELING	N/A	N/A	Hughes	35-8N-8E	NWNESW	3210
61.0	-1180	N/A	-96.433682	35.122083	J W MCCULLOCH INC	G JEFFERSON	N/A	N/A	Hughes	35-8N-8E	NENESW	3281
61.1	-1081	N/A	-96.433682	35.120276	J W MCCULLOCH	G JEFFERSON	N/A	N/A	Hughes	35-8N-8E	SENESW	3290
61.2	-982	6303111.0	-96.433682	35.118469	WAITE PHILLIPS CO	GEO JEFFERSON	N/A	N/A	Hughes	35-8N-8E	NESESW	3013
61.3	384	6321849.0	-96.438100	35.116662	J A FLINT	BULLING	N/A	N/A	Hughes	35-8N-8E	SESWSW	4400
61.3	-1099	6323229.0	-96.433129	35.116210	SIGNATURE EXP INC	SERENDIPITY	N/A	N/A	Hughes	35-8N-8E	SESESESW	1300
61.4	1062	6322357.0	-96.440309	35.114828	LOWRY EXPL	MUDD	N/A	N/A	Hughes	2-7N-8E	CTNWNWN W	4364
61.5	-912	6320359.0	-96.433682	35.113925	OWEN H RIVES	BULLING	N/A	N/A	Hughes	2-7N-8E	EHNENW	4375
61.5	-508	6320777.0	-96.435025	35.113730	I A WYANT	BULLING	N/A	N/A	Hughes	2-7N-8E	NENW	4322
61.7	1097	6300244.0	-96.440309	35.111214	ANDERSON-PRICHARD OIL CORP	TATE	N/A	N/A	Hughes	2-7N-8E	NWSWNW	3448
61.7	-225	6322229.0	-96.435891	35.111214	LOWRY EXPL	HAILEY	N/A	N/A	Hughes	2-7N-8E	NWSENW	4422
61.7	775	6330072.0	-96.439205	35.110310	RUSSELL B PATTERSON	TURNER	N/A	N/A	Hughes	2-7N-8E	CTSWNW	1275
61.9	-862	N/A	-96.433683	35.107600	JONES SHELBURNE INC	PRICE	N/A	N/A	Hughes	2-7N-8E	NENESW	3481
62.0	1251	6322491.0	-96.440862	35.108052	TROJUN OIL & GAS	MIMI	N/A	N/A	Hughes	2-7N-8E	NWNWSW	4226
62.1	1229	6322621.0	-96.441924	35.105360	TROJUN OIL & GAS	KING	N/A	N/A	Hughes	3-7N-8E	SENESE	1255
62.3	-987	6321256.0	-96.435122	35.102042	TROJUN OIL & GAS	MASSAD	N/A	N/A	Hughes	2-7N-8E	SWSESW	4445
62.4	1274	6321132.0	-96.442430	35.098481	GENESIS INC	MUTCH-CHAPMAN	N/A	N/A	Hughes	10-7N-8E	SENENE	4520
62.4	437	6321337.0	-96.440267	35.100288	PAWNEE PETROLEUM CO	MUTCH-HARBER	N/A	N/A	Hughes	11-7N-8E	NWNWNW	4500
62.4	437	6321337.0	-96.440267	35.100288	TROJAN OIL & GAS	MUTCH-HARBER	N/A	N/A	Hughes	11-7N-8E	NWNWNW	4500
62.5	750	6321207.0	-96.440267	35.098481	PAWNEE PETROLEUM CO	MUTCH-HARBER	N/A	N/A	Hughes	11-7N-8E	SWNWNW	4484
62.5	-703	6321248.0	-96.435849	35.100288	J A FLINT	WELCH	N/A	N/A	Hughes	11-7N-8E	NWNENW	3990
62.6	-331	6321271.0	-96.435849	35.098481	J A FLINT	WELCH	N/A	N/A	Hughes	11-7N-8E	SWNENW	4423
62.7	1171	6321746.0	-96.440267	35.096222	ERIC MILLER OIL	WELCH (GEREE)	N/A	N/A	Hughes	11-7N-8E	NWSWNW	4390

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
62.8	1306	6321275.0	-96.440267	35.094867	PAWNEE PETROLEUM CO	MUTCH-HARBER	N/A	N/A	Hughes	11-7N-8E	SWSWNW	4430
62.8	-374	N/A	-96.434745	35.095771	BOETTCHER OIL & GAS CO	SCHRAMM	N/A	N/A	Hughes	11-7N-8E	CTSENW	2974
62.8	678	6321277.0	-96.438058	35.094785	PAWNEE PETROLEUM CO	MUTCH-HARBER	N/A	N/A	Hughes	11-7N-8E	SESWNW	4495
62.9	144	6321286.0	-96.435850	35.093772	J A FLINT	HOTSHOT	N/A	N/A	Hughes	11-7N-8E	NWNESW	4481
62.9	851	6321234.0	-96.438058	35.093060	J A FLINT	GREENWOOD	N/A	N/A	Hughes	11-7N-8E	NENWSW	4467
63.0	1259	N/A	-96.439163	35.092156	BOETTCHER OIL & GAS CO	WALKER	N/A	N/A	Hughes	11-7N-8E	CTNWSW	2927
63.1	-12	N/A	-96.434746	35.092156	BOETTCHER OIL & GAS CO	WESTMOLAND	N/A	N/A	Hughes	11-7N-8E	CTNESW	2960
63.1	1097	N/A	-96.438259	35.091171	LORENE OIL CO	WALKER ESTATE	N/A	N/A	Hughes	11-7N-8E	SENWSW	3148
63.1	-1285	N/A	-96.430326	35.092156	INDEPENDENT OIL & GAS CO	S JACKSON	N/A	N/A	Hughes	11-7N-8E	CTNWSE	3033
63.2	1203	6321261.0	-96.438058	35.089446	J A FLINT	MAJORS	N/A	N/A	Hughes	11-7N-8E	NESWSW	4497
63.4	672	N/A	-96.435850	35.087639	HORMANN CO	WESTMORELAND	N/A	N/A	Hughes	11-7N-8E	SWSESW	2975
63.4	-513	N/A	-96.431430	35.087639	INDEPENDENT OIL & GAS CO	NELLIE PROCTOR	N/A	N/A	Hughes	11-7N-8E	SWSWSE	4426
63.4	-962	N/A	-96.430326	35.088542	PRAIRIE OIL & GAS CO	SALLIE HARJO	N/A	N/A	Hughes	11-7N-8E	CTSWSE	2983
63.6	868	N/A	-96.435319	35.084407	JAMES B BOREN	SMITH	N/A	N/A	Hughes	14-7N-8E	NHSWNENW	1203
63.6	-990	6302173.0	-96.429242	35.085763	W R RAMSEY	JACOBS	N/A	N/A	Hughes	14-7N-8E	NENWNE	2932
63.6	-990	6302173.0	-96.429242	35.085763	W R RAMSEY	JACOBS	N/A	N/A	Hughes	14-7N-8E	NENWNE	3203
63.6	-955	N/A	-96.429242	35.085311	CORTHEL PETROLEUM CORP	DAVIS	N/A	N/A	Hughes	14-7N-8E	NENWNE	1128
63.6	550	N/A	-96.434215	35.084407	CARTHEL PETROLEUM CORP	DAVIS	N/A	N/A	Hughes	14-7N-8E	SENENW	1212
63.6	420	N/A	-96.433663	35.083956	GARRETT & GODFREY	JACOBS	N/A	N/A	Hughes	14-7N-8E	SENENW	2480
63.6	941	N/A	-96.435319	35.083504	JAMES B BOREN	SMITH	N/A	N/A	Hughes	14-7N-8E	SWNENW	1192
63.7	620	N/A	-96.434215	35.083504	OLEN A SMITH	DAVIS	N/A	N/A	Hughes	14-7N-8E	SWSENENW	1217
63.7	-343	N/A	-96.430898	35.083504	JUNCO OIL CO	JOHNSON	N/A	N/A	Hughes	14-7N-8E	SWNWNE	1130
63.7	-706	N/A	-96.429677	35.083600	LYONS PETROLEUM CO	JOHN JACOBS	N/A	N/A	Hughes	14-7N-8E	SENWNE	1114
63.7	540	N/A	-96.433663	35.082600	JUNCO OIL CO	HUFFMAN	N/A	N/A	Hughes	14-7N-8E	NESENW	1204
63.8	621	N/A	-96.433663	35.081697	JUNCO OIL CO	ABBLITT	N/A	N/A	Hughes	14-7N-8E	NESENW	1170
63.9	626	N/A	-96.433663	35.080341	LEWIS-CLARKE PETROLEUM CO	ED ARNOLD	N/A	N/A	Hughes	14-7N-8E	SESENW	988
64.0	-710	N/A	-96.429242	35.078534	LEWIS-CLARKE PETROLEUM CO	ARNOLD	N/A	N/A	Hughes	14-7N-8E	NENWSE	2660
64.1	1054	N/A	-96.435872	35.078534	SOUTHERN OIL CO	HENRY SHAWNEGO	N/A	N/A	Hughes	14-7N-8E	NWNESW	1158

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
64.1	719	N/A	-96.434768	35.077631	PRAIRIE OIL & GAS CO FOR PRODUCERS & REFINERS CORP	HENRY SHAWNEGO	N/A	N/A	Hughes	14-7N-8E	CTNESW	3380
64.1	1063	N/A	-96.435872	35.076727	CHAMPLIN REFINING CO	BELL	N/A	N/A	Hughes	14-7N-8E	SWNESW	4423
64.3	486	N/A	-96.433112	35.075564	JAMES B BOREN	BUCHNER	N/A	N/A	Hughes	14-7N-8E	NESESW	3053
64.3	1315	N/A	-96.435872	35.074920	SOUTHERN OIL CO	HENRY SHAWNEGO	N/A	N/A	Hughes	14-7N-8E	NWSESW	1480
64.4	-334	6321318.0	-96.430346	35.074017	GLENCO PETROLEUM CORP	JACK DURHAM	N/A	N/A	Hughes	14-7N-8E	SWSE	4495
64.4	21	N/A	-96.431450	35.073113	EVANS & LITTRELL INC	JACK DURHAM	N/A	N/A	Hughes	14-7N-8E	SESWSWSE	1125
64.6	-471	N/A	-96.429832	35.070781	JAMES B BOREN	CURTAIN	N/A	N/A	Hughes	23-7N-8E	SWNENWNE	1494
64.7	-308	N/A	-96.430351	35.069426	EL&M DRLG CO	CURTAIN	N/A	N/A	Hughes	23-7N-8E	SHNWNE	1064
64.7	-157	N/A	-96.430903	35.068974	WILLIAM CLARK	WYSOR	N/A	N/A	Hughes	23-7N-8E	SESWNWNE	1027
64.8	1260	N/A	-96.435902	35.069426	MIDWESTERN OIL GROUP	WIPER	N/A	N/A	Hughes	23-7N-8E	CTSWNENW	2810
64.8	446	N/A	-96.433694	35.068071	SUNSET OIL CO	GRAHAM	N/A	N/A	Hughes	23-7N-8E	NESENW	1077
64.8	446	N/A	-96.433694	35.068071	LAMAR HUNT	W R GRAHAM	N/A	N/A	Hughes	23-7N-8E	NESENW	1068
64.9	611	N/A	-96.434313	35.068071	LESLIE C JENKINS	GRAHAM	N/A	N/A	Hughes	23-7N-8E	NESENW	1055
64.9	397	N/A	-96.433795	35.067619	SUNSET OIL CO	GRAHAM	N/A	N/A	Hughes	23-7N-8E	NESENW	1085
64.9	971	N/A	-96.435902	35.067619	MAGNOLIA PETROLEUM CO	W B GRAHAM	N/A	N/A	Hughes	23-7N-8E	NWSENW	4345
64.9	971	N/A	-96.435902	35.067619	MIDWESTERN OIL GROUP	GRAHAM	N/A	N/A	Hughes	23-7N-8E	CTNWSENW	2752
64.9	757	N/A	-96.435350	35.067058	SUNSET OIL CO	GRAHAM	N/A	N/A	Hughes	23-7N-8E	SWNESENW	1078
65.0	900	N/A	-96.435902	35.065812	MIDWESTERN OIL GROUP	GRAHAM	N/A	N/A	Hughes	23-7N-8E	CTSWSENW	2775
65.0	238	N/A	-96.433694	35.065812	C J HAHN	GRAHAM	N/A	N/A	Hughes	23-7N-8E	SESENW	1108
65.0	238	N/A	-96.433694	35.065812	AO DRLG CO	GRAHAM	N/A	N/A	Hughes	23-7N-8E	NWSESENW	1060
65.7	-272	6321705.0	-96.431960	35.055438	B&J PRODUCTION CO	LILLEY LENA	N/A	N/A	Hughes	26-7N-8E	SWNWNE	1414
66.2	861	N/A	-96.435904	35.047731	WOLFE DRLG CO	PRICE	N/A	N/A	Hughes	26-7N-8E	SWNESW	2968
66.9	922	6322215.0	-96.434716	35.038647	MUSTANG PRODUCTION CO	MOORE	N/A	N/A	Hughes	35-7N-8E	CTNHSENW	4813
68.1	1155	6302106.0	-96.433668	35.022293	HUMBLE OIL & REFINING CO	THOMPSON	N/A	N/A	Hughes	2-6N-8E	SESENW	4515
68.3	-880	N/A	-96.426957	35.018678	WEBCO DRLG CO	WOODFORD	N/A	N/A	Hughes	2-6N-8E	SWNESE	2790
68.3	-283	6302113.0	-96.429163	35.018678	WEBCO DRLG CO	WESTERN	N/A	N/A	Hughes	2-6N-8E	SENWSE	2782

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
68.3	1058	N/A	-96.433669	35.018678	DELORIS OIL CO	WALKER	N/A	N/A	Hughes	2-6N-8E	SENESW	2816
68.5	1061	6302107.0	-96.433669	35.016871	MORRIS SITRIN	LILLEY	N/A	N/A	Hughes	2-6N-8E	NESESW	2737
68.5	-950	N/A	-96.426957	35.016871	WEBCO DRLG CO	LEFTWICH	N/A	N/A	Hughes	2-6N-8E	NWSESE	2802
68.6	-286	6302110.0	-96.429163	35.015064	MORRIS SITRIN	WESTERN	N/A	N/A	Hughes	2-6N-8E	SESWSE	2793
68.7	1092	6301910.0	-96.433742	35.013133	C W WILLIAMS	BOTTOMS	N/A	N/A	Hughes	11-6N-8E	NENENW	2732
68.7	393	6301911.0	-96.431410	35.013133	WEBCO DRLG CO	WHITE	N/A	N/A	Hughes	11-6N-8E	NWNWNE	2750
68.7	-268	6301919.0	-96.429204	35.013133	MORRIS SITRIN	WHITE	N/A	N/A	Hughes	11-6N-8E	NENWNE	2761
68.7	-930	6301914.0	-96.426997	35.013133	ALTMAN PETROLEUM CO	HOWARD	N/A	N/A	Hughes	11-6N-8E	NWNENE	2785
68.7	-930	6301914.0	-96.426997	35.013133	KRUMME OIL CO	H B S U (HOWARD)	N/A	N/A	Hughes	11-6N-8E	NWNENE	2785
69.2	401	6301922.0	-96.431410	35.005905	IRON DRLG CO	PEARL ALLEN	N/A	N/A	Hughes	11-6N-8E	NWNWSE	2700
69.2	1097	6301931.0	-96.433742	35.005905	IRON DRLG CO	S M THOMPSON	N/A	N/A	Hughes	11-6N-8E	NENESW	2703
69.3	1157	6301928.0	-96.433742	35.004098	IRON DRLG CO	S M THOMPSON	N/A	N/A	Hughes	11-6N-8E	SENESW	2728
69.3	523	6301921.0	-96.431410	35.004098	IRON DRLG CO	PEARL ALLEN	N/A	N/A	Hughes	11-6N-8E	SWNWSE	2721
69.4	-793	6321776.0	-96.426597	35.004098	BROOKS HALL OIL CORP	ASHLEY	N/A	N/A	Hughes	11-6N-8E	EHSWNESE	4246
69.4	-1315	6301920.0	-96.424792	35.004098	C W WILLIAMS & W M DAY	PEARL ALLEN	N/A	N/A	Hughes	11-6N-8E	SENESE	2722
69.4	771	N/A	-96.431410	35.002291	SUNRAY OIL CORP	WAKELEY	N/A	N/A	Hughes	11-6N-8E	NWSWSE	2739
69.6	304	6301909.0	-96.429204	35.000484	C W WILLIAMS & W M DAY	WAKELEY	N/A	N/A	Hughes	11-6N-8E	SESWSE	2727
69.7	-975	6321196.0	-96.424792	35.000484	DAY & WILLIAMS	WAKELY	N/A	N/A	Hughes	11-6N-8E	SESESE	2671
69.7	-174	6301940.0	-96.426981	34.998683	DAVIS BROTHERS	PARKS B	N/A	N/A	Hughes	14-6N-8E	NWNENE	2689
69.8	616	6301938.0	-96.429120	34.996876	DAVIS BROTHERS	PARKS B	N/A	N/A	Hughes	14-6N-8E	SENWNE	2897
69.9	-454	6301939.0	-96.425467	34.997012	DAVIS BROTHERS	PARKS B	N/A	N/A	Hughes	14-6N-8E	SENENE	2691
70.1	-1098	6302071.0	-96.422585	34.995009	WEBCO DRLG CO ET AL	DAVIS B	N/A	N/A	Hughes	13-6N-8E	NWSWNW	2641
70.1	959	6301941.0	-96.429120	34.993261	DAVIS BROTHERS	PARKS B	N/A	N/A	Hughes	14-6N-8E	SESWNE	2664
70.2	492	6301935.0	-96.426914	34.991454	DAVIS BROTHERS	PARKS D	N/A	N/A	Hughes	14-6N-8E	NWNESE	2663
70.3	1255	6301937.0	-96.428953	34.989647	DAVIS BROTHERS	PARKS C	N/A	N/A	Hughes	14-6N-8E	SENWSE	2633
70.6	1014	N/A	-96.426914	34.986033	DAVIS BROTHERS	ENGLISH B	N/A	N/A	Hughes	14-6N-8E	SWSESE	2625
70.6	-638	6320308.0	-96.421482	34.986878	FERGUSON OIL CO INC	LOVE	N/A	N/A	Hughes	13-6N-8E	SWSW	3236
74.7	703	6322581.0	-96.400017	34.935269	G O PHILPOT DBA TOWNSEND OPER CO	PERKINS PHILPOT ENTERPRISES	N/A	N/A	Hughes	6-5N-9E	SWSENW	3995

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
74.8	-684	6322631.0	-96.395921	34.933462	E LYLE JOHNSON	PERKINS	N/A	N/A	Hughes	6-5N-9E	NWNWSE	0
74.9	579	6322525.0	-96.400569	34.933462	G O PHILPOT DBA TOWNSEND OPER CO	PERKINS PHILPOT ENTERPRIS ES	N/A	N/A	Hughes	6-5N-9E	NWNESW	5900
75.0	1167	6322564.0	-96.402339	34.929765	E LYLE JOHNSON	PERKINS	N/A	N/A	Hughes	6-5N-9E	NESWSW	3806
75.1	765	N/A	-96.400018	34.928944	TEXAS CO	A HICKS	N/A	N/A	Hughes	6-5N-9E	EHWHSESW	2085
75.8	670	6320358.0	-96.398478	34.920738	MELCO PRODUCTION CO	PLUNK	N/A	N/A	Hughes	7-5N-9E	SESENW	5860
76.1	-256	6300317.0	-96.395955	34.915317	JOE GILMORE JR & ASSOC	LEROY MULLINS	N/A	N/A	Hughes	7-5N-9E	NWSWSE	2700
76.8	-1241	6321251.0	-96.391640	34.906282	NATURAL RESOURCE DEV INC	OLIVO	N/A	N/A	Hughes	18-5N-9E	SWSENE	3000
77.3	-420	6323478.0	-96.391090	34.900409	GREEN HORN OIL & GAS	BETTY LOU	N/A	N/A	Hughes	18-5N-9E	SENWSESE	940
77.5	-1006	6300924.0	-96.387461	34.897197	NED BIFFLE ET AL	CHILES	N/A	N/A	Hughes	20-5N-9E	NWNWNW	2800
77.6	960	6322385.0	-96.393843	34.895433	L C BROWN CO	OLIVO	N/A	N/A	Hughes	19-5N-9E	SWNWNE	950
77.6	-356	N/A	-96.389436	34.895433	C L COSHOW	OLIVO	N/A	N/A	Hughes	19-5N-9E	SENENE	3763
77.7	364	N/A	-96.391640	34.893626	SHENANDOAH DRLG	KEITH TWIN	N/A	N/A	Hughes	19-5N-9E	NWSENE	897
77.8	748	6320489.0	-96.392741	34.892010	OKLAHOMA BASIC ECONOMY CORP	OLIVO	N/A	N/A	Hughes	19-5N-9E	NE	2891
78.0	-146	N/A	-96.389436	34.890011	OKLAHOMA-TEXAS OIL CORP	BROADDUS	N/A	N/A	Hughes	19-5N-9E	NENESE	996
78.1	1263	N/A	-96.393843	34.888204	OKLAHOMA-TEXAS OIL CORP	MEANS	N/A	N/A	Hughes	19-5N-9E	SENWSE	949
78.1	-43	N/A	-96.389437	34.888204	OKLAHOMA-TEXAS OIL CORP	MEANS	N/A	N/A	Hughes	19-5N-9E	SENESE	1027
78.1	799	N/A	-96.392191	34.887753	OKLAHOMA-TEXAS OIL CORP	MEANS	N/A	N/A	Hughes	19-5N-9E	SWSWNESE	977
78.2	713	6304489.0	-96.391639	34.886397	OKLAHOMA-TEXAS OIL CORP	BROADDUS	N/A	N/A	Hughes	19-5N-9E	NWSESE	965
78.2	-386	N/A	-96.388011	34.886806	F ALLEN BROWN	CHILES	N/A	N/A	Hughes	20-5N-9E	NWNWSWS W	910
78.2	-533	6300925.0	-96.387461	34.886354	F ALLEN BROWN	CHILES	N/A	N/A	Hughes	20-5N-9E	NWSWSW	2812
78.2	-533	6300925.0	-96.387461	34.886354	NED BIFFLE ET AL	CHILES	N/A	N/A	Hughes	20-5N-9E	NWSWSW	1060
78.3	-1191	6300928.0	-96.385258	34.886354	NED BIFFLE ET AL	R C CHILES	N/A	N/A	Hughes	20-5N-9E	NESWSW	2828
78.3	-1047	6301707.0	-96.385583	34.884999	TOM POTTER	BROADDUS	N/A	N/A	Hughes	20-5N-9E	NWSESWSW	1127
78.4	448	N/A	-96.390538	34.884590	PAUL MILLER	BROODUS	N/A	N/A	Hughes	19-5N-9E	CTSHSESE	912
78.4	119	6300808.0	-96.389436	34.884590	COLLIS DAVIS CO	BROADDUS	N/A	N/A	Hughes	19-5N-9E	CTSESESE	2856
78.4	-537	N/A	-96.387235	34.884547	TOM POTTER	BROADDUS	N/A	N/A	Hughes	20-5N-9E	SWSWSW	2850
78.4	-1128	N/A	-96.385258	34.884547	TOM POTTER ET AL	C C ROSS	N/A	N/A	Hughes	20-5N-9E	SESWSW	2945

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
78.4	-1196	N/A	-96.385032	34.884547	TOM POTTER	BROADDUS	N/A	N/A	Hughes	20-5N-9E	SESWSW	2882
78.5	11	N/A	-96.388887	34.882980	OKLAHOMA-TEXAS OIL CORP	EDD WILSON	N/A	N/A	Hughes	30-5N-9E	NENENENE	950
78.6	-744	6301561.0	-96.385130	34.882528	EDMON L PERKINS	STELLA M RIVES	N/A	N/A	Hughes	29-5N-9E	NENWNW	2900
78.7	149	6320558.0	-96.387333	34.880721	TRIANGLE ENTERPRISES INC	RIVES	N/A	N/A	Hughes	29-5N-9E	SWNWNW	0
78.7	-435	6320709.0	-96.385130	34.880721	TRIANGLE ENTERPRISES INC	RIVES	N/A	N/A	Hughes	29-5N-9E	SENWNW	0
79.2	1030	6300670.0	-96.387884	34.873041	LESLIE WALKER	BUTTRAM	N/A	N/A	Hughes	29-5N-9E	NWSWNWSW	1003
79.3	-458	6320784.0	-96.382928	34.871686	RAMSEY ENGINEERING INC	BOYD	N/A	N/A	Hughes	29-5N-9E	NWSESW	1050
79.4	200	6300422.0	-96.385131	34.869878	W K JONES DRLG CO	J H BRYANT	N/A	N/A	Hughes	29-5N-9E	SESWSW	2512
79.6	237	6300077.0	-96.385270	34.868054	GEORGE J GREER	STARK	N/A	N/A	Hughes	32-5N-9E	NENWNW	1360
80.1	-484	N/A	-96.383068	34.859922	WILLIAM A BRYANT & RAY ALT	BOYD	N/A	N/A	Hughes	32-5N-9E	WHNESW	956
81.5	46	6330028.0	-96.391799	34.841779	APACHE CORP	HUDSON	N/A	N/A	Hughes	6-4N-9E	CTSESE	4464
88.4	682	2920100.0	-96.396101	34.743480	WILSHIRE OIL CO OF TX	HAMILTON	N/A	N/A	Coal	7-3N-9E	NWSE	5702
88.8	324	2920393.0	-96.395145	34.737070	HAZELWOOD PRODUCTION & EXPL CO	HAMILTON	N/A	N/A	Coal	18-3N-9E	CTNENWNE	5920
90.3	-826	2920328.0	-96.390747	34.717194	DIAMOND K OIL & GAS INC	DANIEL	N/A	N/A	Coal	19-3N-9E	SESENE	5589
97.0	-302	2920002.0	-96.357178	34.624901	DOYLE W COTTON JR	SMITH	N/A	N/A	Coal	21-2N-9E	NWSESE	5275
97.4	-1216	2900262.0	-96.353400	34.620780	RAMSEY PETROLEUM CORP ET AL	REPLOGLE	N/A	N/A	Coal	27-2N-9E	NWNWNW	1416
97.5	602	2930002.0	-96.358596	34.618231	DOYLE W COTTON JR	HAAS	N/A	N/A	Coal	28-2N-9E	SWNENE	1412
97.5	679	2900261.0	-96.358536	34.617699	PHILLIPS PETROLEUM CO	PAYTE	N/A	N/A	Coal	28-2N-9E	NWSENE	5200
97.5	679	2900261.0	-96.358536	34.617699	BOETTCHER OIL & GAS CO	PAYTE (SHEEAN)	N/A	N/A	Coal	28-2N-9E	NWSENE	0
97.6	543	2920025.0	-96.357022	34.616185	PHILLIPS PETROLEUM	HOLDER C	N/A	N/A	Coal	28-2N-9E	SWSENE	6380
97.7	643	2920398.0	-96.356806	34.615282	BOTTOMHOLE LTD	CRANE	N/A	N/A	Coal	28-2N-9E	SWSENE	1296
97.7	612	2920361.0	-96.356689	34.615282	BOTTOMHOLE LTD	CRANE (FORMERLY ROBINS)	N/A	N/A	Coal	28-2N-9E	CTSHSENE	6887
97.7	612	2920361.0	-96.356689	34.615282	BOTTOMHOLE LTD	CRANE (FORMERLY ROBBINS)	N/A	N/A	Coal	28-2N-9E	CTSHSENE	6887
97.7	-737	2920008.0	-96.352302	34.616262	IDEAL CEMENT CO	HARRYMAN	N/A	N/A	Coal	27-2N-9E	SWNW	6970
97.8	784	2920416.0	-96.356690	34.613748	RANKEN ENERGY CORP	CRANE	N/A	N/A	Coal	28-2N-9E	NENESE	5120
97.9	-1279	ZZ005635	-96.349341	34.612648	CARTER OIL CO	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTWHNESW	6722
97.9	-1279	ZZ005635	-96.349341	34.612648	CARTER OIL CO	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTWHNESW	0

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
98.0	1245	2920294.0	-96.357788	34.611667	GOMACO INC	HOLDER	N/A	N/A	Coal	28-2N-9E	SWNESE	7227
98.0	584	N/A	-96.355592	34.611667	PAN AMERICAN PETROLEUM CORP	MAY UNIT	N/A	N/A	Coal	28-2N-9E	SENESE	0
98.0	-76	2900267.0	-96.353400	34.611744	CARTER OIL	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTSWNWSW	6899
98.0	-76	2900267.0	-96.353400	34.611744	HUMBLE OIL & REFINING CO	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTSWNWSW	6899
98.0	-76	2900267.0	-96.353400	34.611744	ENERGY RESERVES GROUP INC	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTSWNWSW	0
98.0	-76	2900267.0	-96.353400	34.611744	GARY MATTHEWS OIL & GAS	CLAYTOR C-56	N/A	N/A	Coal	27-2N-9E	CTSWNWSW	6899
98.1	740	2900219.0	-96.355592	34.609860	TWIN OIL CORP	J ARRINGTON	N/A	N/A	Coal	28-2N-9E	NESESE	6894
98.1	740	2900219.0	-96.355592	34.609860	ATLANTIC RICHFIELD CO	ARRINGTON UNIT	N/A	N/A	Coal	28-2N-9E	NESESE	6891
98.1	740	2900219.0	-96.355592	34.609860	ARCO OIL & GAS CO	ARRINGTON UNIT	N/A	N/A	Coal	28-2N-9E	NESESE	0
98.2	-539	2900247.0	-96.351204	34.609937	DRLG & EXPL CO INC	CODY	N/A	N/A	Coal	27-2N-9E	NESWSW	7656
98.2	-539	2900247.0	-96.351204	34.609937	ARCO OIL & GAS CO	CODY UNIT	N/A	N/A	Coal	27-2N-9E	NESWSW	7643
98.2	-712	2920422.0	-96.350606	34.609937	OAKLAND PETROLEUM OPERATING CO INC	ROBINS	N/A	N/A	Coal	27-2N-9E	NESWSW	8750
98.2	-110	2900080.0	-96.352302	34.609034	TRIPOWER RESOURCES INC	CODY UNIT DE	N/A	N/A	Coal	27-2N-9E	CTSWSW	7003
98.2	-737	2920003.0	-96.350323	34.609622	IDEAL CEMENT CO	CLAYTOR-BOOCH	N/A	N/A	Coal	27-2N-9E	NESWSW	1756
98.4	-586	2920327.0	-96.349009	34.607473	ENERGY RESERVES GROUP INC	CENTRAHOMA TOWNSITE	N/A	N/A	Coal	27-2N-9E	SWSESW	6993
98.4	-586	2920327.0	-96.349009	34.607473	ENERGY RESERVES GROUP INC	CENTRAHOMA TOWNSITE	N/A	N/A	Coal	27-2N-9E	SWSESW	6993
98.4	-586	2920327.0	-96.349009	34.607473	TRIPOWER RESOURCES INC	CENTRAHOMA TOWNSITE	N/A	N/A	Coal	27-2N-9E	SWSESW	6993
98.4	-621	2920339.0	-96.348842	34.607473	ENERGY RESERVES GROUP INC	CENTRAHOMA TOWNSITE	N/A	N/A	Coal	27-2N-9E	SESWSESW	1790
98.4	-621	2920339.0	-96.348842	34.607473	OAKLAND PETROLEUM OPER CO INC	CENTRAHOMA TOWNSITE	N/A	N/A	Coal	27-2N-9E	SESWSESW	1790
98.5	-919	2900248.0	-96.346810	34.606322	HUMBLE OIL & REFINING CO	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	NENENW	6927
98.5	-919	2900248.0	-96.346810	34.606322	HUMBLE OIL & REFINING CO	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	NENENW	6927
98.5	-919	2900248.0	-96.346810	34.606322	ENERGY RESERVES GROUP INC	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	NENENW	6927
98.5	-919	2900248.0	-96.346810	34.606322	TRIPOWER RESOURCES INC	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	NENENW	6927
98.6	-313	2900159.0	-96.347907	34.604515	CARTER OIL CO	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	CTSHNENW	7126
98.6	-313	2900159.0	-96.347907	34.604515	CARTER OIL CO	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	CTSHNENW	7126
98.6	-313	2900159.0	-96.347907	34.604515	CARTER OIL CO	JOHN THOMPSON	N/A	N/A	Coal	34-2N-9E	CTSHNENW	7126

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
98.7	-1216	N/A	-96.344488	34.604515	J A BEARMAN	J R KITCHEL	N/A	N/A	Coal	34-2N-9E	SWNWNE	0
98.7	-1216	N/A	-96.344488	34.604515		J BURMAN	N/A	N/A	Coal	34-2N-9E	SWNWNE	2780
98.7	-974	2900136.0	-96.344488	34.602708	J R KITCHEL	OKLA PORTLAND CEMENT	N/A	N/A	Coal	34-2N-9E	NWSWNE	2130
99.8	467	2920420.0	-96.343389	34.587938	CUMA OIL CO INC	REYNOLDS	N/A	N/A	Coal	3-1N-9E	CTNHSWNE	2075
101.5	-1242	2920481.0	-96.330281	34.569054	GLENN SUPPLY CO INC	MAYER	N/A	N/A	Coal	11-1N-9E	NESW	2014
103.9	1147	2920455.0	-96.317114	34.536135	DRACO PRODUCTION CO	COSTELLO	N/A	N/A	Coal	24-1N-9E	SHSWSW	1680
104.1	-909	2900106.0	-96.309404	34.535505	G F GALBREATH	GALBREATH-RUMMELL ETAL	N/A	N/A	Coal	24-1N-9E	SWSWSE	3380
105.3	818	2920577.0	-96.305521	34.518359	W C PAYNE FAMILY TRUST	HAMPTON	N/A	N/A	Coal	36-1N-9E	WHWHNENE	1755
125.8	-318	520042.0	-96.174025	34.252596	EXXON CORP	A MULLEN	N/A	N/A	Atoka	32-3S-11E	NHSHSENW	13188
125.9	209	520053.0	-96.175119	34.250488	BEDROCK INC	J LEE	N/A	N/A	Atoka	32-3S-11E	NWNESW	2257
126.0	-1191	520056.0	-96.170735	34.252295	LATILO INVESTMENTS	SIPES	N/A	N/A	Atoka	32-3S-11E	CTSWSWNE	2240
130.7	778	520044.0	-96.157436	34.186429	JOHN A TAYLOR	INGRAM	N/A	N/A	Atoka	21-4S-11E	SESWSESW	3079
130.7	778	520044.0	-96.157436	34.186429	FUNK EXPL INC	INGRAM	N/A	N/A	Atoka	21-4S-11E	SESWSESW	6105
131.6	-1129	520043.0	-96.144566	34.177032	JOHN A TAYLOR	TIGERT	N/A	N/A	Atoka	27-4S-11E	CTWHNWSW	1329
133.3	-1109	1300321.0	-96.130448	34.156049	TEXACO INC	STUART-STATE	N/A	N/A	Bryan	3-5S-11E	NENENE	2126
204.5	-176	N/A	-95.480359	33.315971	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
206.2	-1033	N/A	-95.461476	33.296930	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
206.5	-786	N/A	-95.459100	33.293304	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
206.9	-616	N/A	-95.454947	33.287841	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
207.0	-1207	N/A	-95.452787	33.287508	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
207.4	-810	N/A	-95.450729	33.282617	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
213.8	645	N/A	-95.392894	33.204452	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
214.3	456	N/A	-95.388026	33.198446	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
214.5	1041	N/A	-95.387485	33.194588	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
214.6	-1224	N/A	-95.379985	33.196188	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
219.7	751	N/A	-95.338633	33.131741	N/A	N/A	N/A	N/A	Hopkins	N/A	N/A	N/A
223.3	928	N/A	-95.305163	33.089223	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
226.6	-1299	N/A	-95.269707	33.052024	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
229.2	-577	N/A	-95.255206	33.020490	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
229.6	340	N/A	-95.255125	33.014529	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
229.7	308	N/A	-95.254584	33.012240	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
230.2	-407	N/A	-95.250873	33.005630	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
231.5	163	N/A	-95.249441	32.987139	N/A	N/A	N/A	N/A	Franklin	N/A	N/A	N/A
235.5	1293	N/A	-95.234808	32.932411	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
236.2	993	N/A	-95.230608	32.922898	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
240.5	618	N/A	-95.208350	32.863409	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
255.2	-447	N/A	-95.156634	32.662828	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
257.4	1074	N/A	-95.157987	32.632806	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
257.5	795	N/A	-95.157108	32.630961	N/A	N/A	N/A	N/A	Wood	N/A	N/A	N/A
262.3	-813	N/A	-95.135116	32.564699	N/A	N/A	N/A	N/A	Upshur	N/A	N/A	N/A
272.0	-968	N/A	-95.100461	32.431078	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
272.2	-866	N/A	-95.100074	32.428417	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
272.7	987	N/A	-95.104070	32.420474	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
272.8	-306	N/A	-95.099803	32.420598	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
273.2	-381	N/A	-95.098013	32.414964	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
273.2	1070	N/A	-95.102384	32.413296	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
273.5	709	N/A	-95.100408	32.410201	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
273.6	-411	N/A	-95.096590	32.409139	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
273.8	467	N/A	-95.099593	32.406165	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.0	-1197	N/A	-95.094556	32.402214	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.0	489	N/A	-95.100037	32.402202	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.3	97	N/A	-95.098784	32.398735	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.3	-142	N/A	-95.097575	32.398310	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.4	-1026	N/A	-95.094459	32.398648	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.4	936	N/A	-95.099755	32.395657	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.8	-1362	N/A	-95.089863	32.394055	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
274.8	505	N/A	-95.094849	32.391141	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
274.9	-708	N/A	-95.090357	32.390484	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.0	-1346	N/A	-95.088254	32.389687	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.0	-1104	N/A	-95.089031	32.389517	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.0	-674	N/A	-95.090410	32.389109	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.4	811	N/A	-95.094997	32.383714	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.4	-1037	N/A	-95.089045	32.384957	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.6	194	N/A	-95.090969	32.380825	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.6	240	N/A	-95.090907	32.380635	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.7	-1253	N/A	-95.086657	32.382882	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.7	-1227	N/A	-95.085852	32.380790	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.8	748	N/A	-95.091750	32.378360	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.8	-727	N/A	-95.086988	32.378882	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
275.8	663	N/A	-95.091306	32.377773	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.0	-444	N/A	-95.087280	32.376522	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.0	-403	N/A	-95.087179	32.375670	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.1	646	N/A	-95.090406	32.374717	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.1	-529	N/A	-95.086456	32.374570	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.3	-333	N/A	-95.086372	32.371899	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.3	944	N/A	-95.090307	32.370772	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.3	1263	N/A	-95.091301	32.370523	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.8	-120	N/A	-95.086231	32.365182	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
276.9	-1240	N/A	-95.081492	32.365334	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.0	-449	N/A	-95.083011	32.362251	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.1	1299	N/A	-95.088175	32.359891	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.3	625	N/A	-95.085536	32.358432	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.3	-491	N/A	-95.082008	32.359098	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.3	-325	N/A	-95.082312	32.358178	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.4	797	N/A	-95.085544	32.356354	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
277.5	-102	N/A	-95.082357	32.355668	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.5	-25	N/A	-95.082432	32.355021	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.5	1065	N/A	-95.085836	32.354220	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.6	-785	N/A	-95.079857	32.354849	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
277.9	716	N/A	-95.083161	32.348717	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
278.6	-1082	N/A	-95.074386	32.341062	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
278.6	-1132	N/A	-95.074189	32.340951	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
278.9	-1026	N/A	-95.073680	32.337764	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
279.3	-696	N/A	-95.074080	32.331037	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
279.4	394	N/A	-95.077610	32.330069	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
279.6	236	N/A	-95.076704	32.326205	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
279.9	-1283	N/A	-95.071086	32.325557	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
279.9	-1118	N/A	-95.071410	32.325187	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
280.1	620	N/A	-95.075303	32.320229	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
281.6	1358	N/A	-95.071692	32.299242	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
282.0	459	N/A	-95.067351	32.293521	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
282.6	833	N/A	-95.066029	32.284235	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
286.0	-953	N/A	-95.048671	32.239408	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
287.1	59	N/A	-95.046457	32.223068	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
287.2	643	N/A	-95.047823	32.221017	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
287.6	-346	N/A	-95.042444	32.217183	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
287.8	906	N/A	-95.046535	32.213174	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
287.9	-664	N/A	-95.041367	32.213334	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
288.1	971	N/A	-95.045662	32.209213	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
288.2	-372	N/A	-95.041046	32.208706	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
288.5	-662	N/A	-95.040497	32.205823	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
288.6	-1353	N/A	-95.037351	32.205054	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
288.6	332	N/A	-95.042149	32.202821	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
289.4	-966	N/A	-95.035123	32.192201	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
290.6	500	N/A	-95.034708	32.175491	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
290.6	79	N/A	-95.033293	32.175429	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
290.8	-122	N/A	-95.032045	32.173053	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
291.0	-1310	N/A	-95.026995	32.171260	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
291.7	-1182	N/A	-95.024514	32.161135	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
292.9	-222	N/A	-95.024018	32.143912	N/A	N/A	N/A	N/A	Smith	N/A	N/A	N/A
293.7	1145	N/A	-95.024513	32.131393	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
296.0	-595	N/A	-95.008498	32.101138	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
296.8	735	N/A	-95.008773	32.089700	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
297.4	1232	N/A	-95.007040	32.080429	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
297.8	-109	N/A	-95.001157	32.076805	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
297.9	-131	N/A	-95.000356	32.074651	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
298.2	531	N/A	-95.000780	32.069708	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
298.6	-692	N/A	-94.995199	32.065785	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
298.6	-797	N/A	-94.994701	32.065387	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.1	-464	N/A	-94.993250	32.058430	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.1	-693	N/A	-94.992506	32.058509	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.3	-1048	N/A	-94.990739	32.056971	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.5	-1111	N/A	-94.989428	32.054013	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.7	-1012	N/A	-94.988589	32.050902	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.7	-146	N/A	-94.991116	32.049800	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.7	-685	N/A	-94.989446	32.050222	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.8	-132	N/A	-94.990846	32.048936	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.9	670	N/A	-94.992787	32.046832	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.9	-790	N/A	-94.988248	32.047910	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
299.9	36	N/A	-94.990767	32.047171	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.0	-635	N/A	-94.988275	32.046560	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.0	834	N/A	-94.992745	32.045197	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.1	-127	N/A	-94.989495	32.045196	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
300.1	398	N/A	-94.991008	32.044481	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.1	-838	N/A	-94.987009	32.044968	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.1	-423	N/A	-94.988182	32.044341	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.2	981	N/A	-94.992300	32.042630	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
300.4	487	N/A	-94.989597	32.039801	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
301.1	-316	N/A	-94.983677	32.030899	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
302.8	750	N/A	-94.979062	32.008308	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
303.9	208	N/A	-94.971690	31.992868	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
304.7	1029	N/A	-94.970262	31.981362	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
304.8	429	N/A	-94.968134	31.981076	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
304.8	429	N/A	-94.968134	31.981076	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
304.8	1243	N/A	-94.970335	31.979566	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
304.9	545	N/A	-94.967959	31.979514	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
305.0	182	N/A	-94.966184	31.978009	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
305.1	-549	N/A	-94.963659	31.977870	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
308.0	492	N/A	-94.951749	31.937230	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
309.2	981	N/A	-94.947864	31.920075	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
309.5	-406	N/A	-94.942321	31.917671	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
309.7	1008	N/A	-94.945444	31.913106	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
310.3	-347	N/A	-94.938137	31.905483	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
310.8	-635	N/A	-94.934754	31.899135	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
312.6	936	N/A	-94.929738	31.873520	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
314.2	-267	N/A	-94.916941	31.852240	N/A	N/A	N/A	N/A	Rusk	N/A	N/A	N/A
325.0	1183	N/A	-94.878050	31.702204	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
325.2	-622	N/A	-94.871583	31.700636	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
325.5	135	N/A	-94.872878	31.696464	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
325.7	-967	N/A	-94.868561	31.694264	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
326.0	-1039	N/A	-94.867120	31.690204	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
326.2	865	N/A	-94.872530	31.685566	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
326.3	-833	N/A	-94.867067	31.685413	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
326.5	-258	N/A	-94.868833	31.681830	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
326.7	-1160	N/A	-94.865857	31.678519	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
327.0	183	N/A	-94.869908	31.674094	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
327.1	-816	N/A	-94.866699	31.673036	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
327.4	-150	N/A	-94.869879	31.669324	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
327.6	-156	N/A	-94.872258	31.666480	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
327.9	-235	N/A	-94.875964	31.664177	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
329.0	-721	N/A	-94.877124	31.650719	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
329.2	207	N/A	-94.880675	31.647636	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
329.8	-295	N/A	-94.880714	31.638594	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
330.2	-568	N/A	-94.881013	31.632222	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
331.1	1065	N/A	-94.888266	31.621529	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
332.4	-601	N/A	-94.888193	31.602904	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
333.3	414	N/A	-94.892607	31.590145	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
333.6	-477	N/A	-94.889766	31.586011	N/A	N/A	N/A	N/A	Nacogdoches	N/A	N/A	N/A
335.5	-347	N/A	-94.898136	31.558797	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
336.2	1081	N/A	-94.906525	31.550301	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
337.7	1190	N/A	-94.922700	31.534901	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
337.7	1297	N/A	-94.923132	31.533810	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
337.7	1297	N/A	-94.923132	31.533810	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
337.9	-1141	N/A	-94.915540	31.530766	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
338.0	844	N/A	-94.921994	31.529953	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
338.1	-123	N/A	-94.919015	31.528339	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
338.8	140	N/A	-94.918508	31.518049	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
338.9	-748	N/A	-94.915607	31.517908	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
339.0	1324	N/A	-94.922030	31.515203	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
339.7	978	N/A	-94.920717	31.505396	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
340.3	835	N/A	-94.920055	31.495936	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
340.4	-293	N/A	-94.916406	31.494563	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
340.5	-617	N/A	-94.915351	31.493942	N/A	N/A	N/A	N/A	Cherokee	N/A	N/A	N/A
341.0	298	N/A	-94.917850	31.486283	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
341.5	941	N/A	-94.918306	31.482361	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
341.5	-1375	N/A	-94.912770	31.478037	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
341.7	-261	N/A	-94.916359	31.477779	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
341.9	-539	N/A	-94.915100	31.473984	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
342.8	507	N/A	-94.920069	31.462146	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
343.5	-1080	N/A	-94.915563	31.452495	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
352.5	1324	N/A	-94.885542	31.332402	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
367.0	-1200	N/A	-94.803073	31.152847	N/A	N/A	N/A	N/A	Angelina	N/A	N/A	N/A
374.0	-1091	N/A	-94.773101	31.078672	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
374.2	1256	N/A	-94.780933	31.076813	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
389.2	-457	N/A	-94.796925	30.861934	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
389.9	1223	N/A	-94.802463	30.852228	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
390.2	692	N/A	-94.800699	30.846790	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
394.0	-373	N/A	-94.799549	30.794009	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
396.0	577	N/A	-94.806737	30.765023	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
396.0	-276	N/A	-94.804057	30.764465	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
396.4	-46	N/A	-94.805250	30.759492	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
412.7	514	N/A	-94.800426	30.528840	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
413.9	638	N/A	-94.794385	30.513230	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
414.2	446	N/A	-94.791204	30.509246	N/A	N/A	N/A	N/A	Polk	N/A	N/A	N/A
419.1	-315	N/A	-94.750494	30.453509	N/A	N/A	N/A	N/A	Liberty	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
422.1	-38	N/A	-94.742387	30.415185	N/A	N/A	N/A	N/A	Liberty	N/A	N/A	N/A
434.0	878	N/A	-94.689677	30.249459	N/A	N/A	N/A	N/A	Liberty	N/A	N/A	N/A
443.8	-370	N/A	-94.568300	30.157614	N/A	N/A	N/A	N/A	Hardin	N/A	N/A	N/A
443.9	-294	N/A	-94.566660	30.156712	N/A	N/A	N/A	N/A	Hardin	N/A	N/A	N/A
444.2	-627	N/A	-94.562868	30.157074	N/A	N/A	N/A	N/A	Hardin	N/A	N/A	N/A
450.6	341	N/A	-94.464745	30.115947	N/A	N/A	N/A	N/A	Hardin	N/A	N/A	N/A
452.6	833	N/A	-94.435816	30.103021	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
453.7	852	N/A	-94.418552	30.096130	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
454.6	-1135	N/A	-94.402791	30.095887	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
455.4	-1156	N/A	-94.391304	30.091400	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
455.6	96	N/A	-94.388472	30.086491	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
456.7	-1090	N/A	-94.373881	30.092147	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
459.4	-224	N/A	-94.328244	30.097335	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
461.6	409	N/A	-94.295974	30.082784	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
462.8	979	N/A	-94.287016	30.075678	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
468.0	1164	N/A	-94.215389	30.029514	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
468.5	-937	N/A	-94.204431	30.029790	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
468.6	-1334	N/A	-94.202106	30.027774	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.0	-104	N/A	-94.204872	30.023504	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.0	500	N/A	-94.203621	30.021865	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.1	-690	N/A	-94.203059	30.025142	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.1	-467	N/A	-94.201945	30.024540	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.2	506	N/A	-94.200456	30.021880	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
469.3	-1050	N/A	-94.197820	30.025866	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.0	805	N/A	-94.187673	30.017700	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.1	-52	N/A	-94.187256	30.020151	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.3	879	N/A	-94.184025	30.018024	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.3	630	N/A	-94.183385	30.018812	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.5	-820	N/A	-94.179012	30.021549	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A

Appendix L - Oil and Gas Wells within 1,320 Feet of the Proposed ROW

Milepost	Distance (feet)	API Number	Longitude	Latitude	Operator	Well Name	Well Status	Field	County	Location (S-T-R)	QQ	Total Depth (feet)
470.6	-161	N/A	-94.179725	30.019821	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.6	-161	N/A	-94.179725	30.019821	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
470.6	102	N/A	-94.179242	30.018750	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
471.1	-43	N/A	-94.171844	30.015573	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
471.3	2	N/A	-94.169136	30.014099	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
471.5	563	N/A	-94.166671	30.010935	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
472.0	10	N/A	-94.159876	30.009023	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
474.0	-1316	N/A	-94.127449	30.004505	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
475.6	184	N/A	-94.103846	29.996036	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
475.8	1193	N/A	-94.099715	29.993087	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
476.5	232	N/A	-94.088847	29.994451	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
477.5	205	N/A	-94.077451	29.988824	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A
482.6	-546	N/A	-94.007660	29.995633	N/A	N/A	N/A	N/A	Jefferson	N/A	N/A	N/A

-This page intentionally left blank-

APPENDIX M

Soil Summary for Montana, South Dakota, and Nebraska

-This page intentionally left blank-

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
MONTANA								
FEIS	0.00	25.17	No Changes from FEIS					
RV-1001	25.17	25.25	0.08	422.15	MT641	347661	301C	Marvan complex, 2 to 8 percent slopes
RV-1001	25.25	25.27	0.02	112.76	MT641	347792	901A	Lallie clay loam, 0 to 1 percent slopes
RV-1001	25.27	25.29	0.02	125.52	MT641	347832	W	Water
RV-1001	25.29	25.34	0.04	237.43	MT641	347792	901A	Lallie clay loam, 0 to 1 percent slopes
RV-1001	25.34	25.37	0.04	194.50	MT641	347797	90A	Harlake clay, 0 to 2 percent slopes
RV-1001	25.37	25.50	0.12	652.42	MT105	345542	27	Havre-Harlem silty clays
RV-1001	25.50	25.68	0.18	968.00	MT105	345540	25	Havre silty clay loam
RV-1001	25.68	25.68	0.00	3.24	MT105	345578	6	Cabbart-Delpoint complex, 9 to 35 percent slopes
FEIS	25.68	71.56	No Changes from FEIS					
RV-1002	71.56	71.72	0.16	827.69	MT105	345588	69	Thoeny-Phillips complex, 1 to 5 percent slopes
RV-1002	71.72	71.86	0.14	752.70	MT105	345595	75	Ustic Torrifluvents, gently sloping
RV-1002	71.86	72.21	0.35	1,856.20	MT105	345566	49	Phillips-Scobey complex, 2 to 9 percent slopes
FEIS	72.21	73.57	No Changes from FEIS					
RV-1003	109.54	109.64	0.10	528.21	MT055	344367	166	Yawdim-Badland-Gerdrum association
RV-1003	109.64	109.71	0.06	341.36	MT055	344316	12	Benz clay loam, 0 to 8 percent slopes
RV-1003	109.71	109.77	0.06	295.11	MT055	344409	46	Chinook fine sandy loam, 0 to 4 percent slopes
RV-1003	109.77	109.87	0.10	537.75	MT055	344427	62	Eapa-Gerdrum complex, 2 to 8 percent slopes
RV-1003	109.87	109.92	0.05	281.69	MT055	344318	121	Rominell loam, gullied, 0 to 8 percent slopes
RV-1003	109.92	110.20	0.28	1,461.49	MT055	344427	62	Eapa-Gerdrum complex, 2 to 8 percent slopes
RV-1003	110.20	110.31	0.11	594.25	MT055	344382	21	Busby-Twilight fine sandy loams, 2 to 8 percent slopes
FEIS	110.31	285.64	No Changes from FEIS					
SOUTH DAKOTA								
FEIS	285.64	296.22	No Change from FEIS					
RV-1004	296.22	296.45	0.23	1,229.47	SD063	355804	TxE	Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes
RV-1004	296.45	296.52	0.07	343.56	SD063	355805	TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes
RV-1004	296.52	296.82	0.30	1,597.04	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1004	296.82	296.93	0.11	594.57	SD063	355729	CeE	Cabbart-Rock outcrop complex, 15 to 40 percent slopes
RV-1004	296.93	297.25	0.32	1,664.31	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1004	297.25	297.38	0.13	685.79	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1004	297.38	297.44	0.06	300.25	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1004	297.44	297.49	0.05	272.14	SD063	355797	TnB	Tanna silty clay loam, 2 to 9 percent slopes
RV-1004	297.49	297.57	0.08	422.22	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1004	297.57	297.62	0.05	266.81	SD063	355797	TnB	Tanna silty clay loam, 2 to 9 percent slopes
RV-1004	297.62	297.67	0.05	288.63	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1004	297.67	297.72	0.05	268.42	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1004	297.72	297.72	0.00	1.28	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
FEIS	297.72	315.09	No Change from FEIS					
RV-1005	315.09	315.49	0.40	2,113.06	SD063	355804	TxE	Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes
RV-1005	315.49	315.73	0.24	1,274.29	SD063	355781	RmB	Rhame-Parchin fine sandy loams, 2 to 6 percent slopes
RV-1005	315.73	315.75	0.02	112.35	SD063	355801	TtC	Trey-Fleak loamy fine sands, 2 to 15 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
FEIS	315.75	331.94	No Change from FEIS					
RV-1006	331.94	331.98	0.04	205.92	SD063	355780	RhB	Rhame fine sandy loam, 2 to 6 percent slopes
RV-1006	331.98	332.23	0.26	1,348.26	SD063	355712	AkA	Archin-Bullock fine sandy loams, 0 to 4 percent slopes
RV-1006	332.23	332.33	0.09	495.02	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1006	332.33	332.35	0.03	134.68	SD063	355717	AwB	Attewan loam, 2 to 6 percent slopes
RV-1006	332.35	332.37	0.02	108.87	SD063	355771	NaD	Nihill variant-Attewan complex, 4 to 40 percent slopes
RV-1006	332.37	332.43	0.06	314.55	SD063	355756	Ke	Korchea loam
RV-1006	332.43	332.50	0.06	341.42	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1006	332.50	332.59	0.09	485.78	SD063	355712	AkA	Archin-Bullock fine sandy loams, 0 to 4 percent slopes
RV-1006	332.59	332.71	0.12	620.43	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1006	332.71	332.93	0.22	1,152.80	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
FEIS	332.93	350.84	No Change from FEIS					
RV-1007	350.84	350.94	0.11	563.70	SD063	355723	BpB	Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes
RV-1007	350.94	351.00	0.06	294.27	SD063	355724	BsA	Bullock-Slickspots complex, 0 to 4 percent slopes
RV-1007	351.00	351.10	0.10	517.69	SD063	355723	BpB	Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes
RV-1007	351.10	351.18	0.08	415.73	SD063	355805	TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes
RV-1007	351.18	351.27	0.10	504.50	SD063	355781	RmB	Rhame-Parchin fine sandy loams, 2 to 6 percent slopes
RV-1007	351.27	351.30	0.02	124.21	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1007	351.30	351.48	0.18	970.55	SD063	355722	BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
RV-1007	351.48	351.52	0.04	195.94	SD063	355804	TxE	Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes
RV-1007	351.52	351.59	No Change from FEIS					
FEIS	354.42	354.62	0.20	1,066.46	SD063	355805	TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes
RV-1008	354.62	354.87	0.26	1,352.90	SD063	355805	TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes
RV-1008	354.87	354.92	0.05	247.79	SD063	355758	Km	Korchea-Archin complex
RV-1008	354.92	355.02	0.09	501.04	SD063	355729	CeE	Cabbart-Rock outcrop complex, 15 to 40 percent slopes
RV-1008	355.02	355.06	0.05	238.39	SD063	355783	RnB	Rhoades-Daglum loams, 2 to 9 percent slopes
RV-1008	355.06	355.22	0.15	814.28	SD063	355772	PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
RV-1008	355.22	355.27	0.06	305.38	SD063	355723	BpB	Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes
FEIS	355.27	361.76	No Change from FEIS					
RV-1009	361.76	361.94	0.18	968.85	SD019	353257	ZeB	Zeona loamy fine sand, 0 to 6 percent slopes
RV-1009	361.94	362.04	0.10	530.11	SD019	353141	AnA	Archin-Slickspots complex, 0 to 3 percent slopes
RV-1009	362.04	362.10	0.06	325.06	SD019	353147	Bd	Badland
RV-1009	362.10	362.14	0.04	218.82	SD019	353249	TfD	Twilight fine sandy loam, 3 to 25 percent slopes
RV-1009	362.14	362.18	0.03	180.33	SD019	353136	AeB	Absher-Slickspots complex, 0 to 9 percent slopes
RV-1009	362.18	362.31	0.14	714.69	SD105	354608	AbC	Bullock-Slickspots complex, 0 to 15 percent slopes
RV-1009	362.31	362.44	0.12	651.42	SD105	354666	TcD	Twilight-Marmarth-Parchin association, gently rolling
FEIS	362.44	366.31	No Change from FEIS					
RV-1010	366.31	366.33	0.02	112.45	SD105	354607	AaB	Bullock-Parchin loams, 0 to 9 percent slopes
RV-1010	366.33	366.39	0.06	305.84	SD105	354661	Sd	Shambo loam, channeled
RV-1010	366.39	366.78	0.39	2,079.01	SD105	354607	AaB	Bullock-Parchin loams, 0 to 9 percent slopes
RV-1010	366.78	366.82	0.04	189.28	SD105	354666	TcD	Twilight-Marmarth-Parchin association, gently rolling
FEIS	366.82	366.96	0.15	770.80	SD105	354666	TcD	Twilight-Marmarth-Parchin association, gently rolling
FEIS	370.16	370.18	0.02	93.70	SD105	354608	AbC	Bullock-Slickspots complex, 0 to 15 percent slopes
RV-1011	370.18	370.24	0.06	311.02	SD105	354608	AbC	Bullock-Slickspots complex, 0 to 15 percent slopes
RV-1011	370.24	370.29	0.05	267.50	SD105	354607	AaB	Bullock-Parchin loams, 0 to 9 percent slopes
RV-1011	370.29	370.47	0.18	935.48	SD105	354608	AbC	Bullock-Slickspots complex, 0 to 15 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1011	370.47	370.66	0.20	1,037.17	SD105	354665	Tb	Trembles soils, channeled
RV-1011	370.66	370.68	0.01	62.30	SD105	354660	Sc	Shambo loam
RV-1011	370.68	370.75	0.08	399.79	SD105	354608	AbC	Bullock-Slickspots complex, 0 to 15 percent slopes
RV-1011	370.75	370.82	0.07	374.65	SD105	354660	Sc	Shambo loam
FEIS	370.82	380.56	No Change from FEIS					
RV-1012	380.56	380.73	0.18	926.05	SD601	355473	TwC	Twilight-Marmarth-Parchin fine sandy loams, 4 to 9 percent slopes
RV-1012	380.73	380.96	0.22	1,175.93	SD601	355426	BpB	Bullock-Parchin fine sandy loams, 0 to 4 percent slopes
RV-1012	380.96	381.20	0.25	1,308.86	SD601	355456	PbB	Parchin-Bullock fine sandy loams, 2 to 6 percent slopes
FEIS	381.20	388.26	No Change from FEIS					
RV-1013	388.26	388.39	0.13	690.11	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1013	388.39	388.59	0.19	1,026.83	SD601	355450	LcA	Loburn-Gerdrum loams, 0 to 3 percent slopes
RV-1013	388.59	388.77	0.19	978.29	SD601	355420	AtC	Assinniboine-Twilight fine sandy loams, 6 to 9 percent slopes
RV-1013	388.77	388.90	0.13	694.24	SD601	355426	BpB	Bullock-Parchin fine sandy loams, 0 to 4 percent slopes
FEIS	388.90	398.24	No Change from FEIS					
RV-1014	398.24	398.39	0.14	748.40	SD601	355430	DeC	Delridge-Cabbart loams, 6 to 15 percent slopes
RV-1014	398.39	398.49	0.11	560.27	SD601	355419	AsC	Assinniboine fine sandy loam, 6 to 9 percent slopes
RV-1014	398.49	398.55	0.06	321.68	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	398.55	398.68	0.13	674.13	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1014	398.68	398.72	0.04	229.74	SD601	355423	BlE	Blackhall-Rock outcrop complex, 15 to 40 percent slopes
RV-1014	398.72	398.74	0.01	72.55	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1014	398.74	398.80	0.06	308.47	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	398.80	398.86	0.06	317.17	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	398.86	398.88	0.03	145.05	SD601	355432	EaB	Eapa loam, 2 to 6 percent slopes
RV-1014	398.88	398.89	0.00	23.14	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	398.89	398.93	0.05	245.16	SD601	355430	DeC	Delridge-Cabbart loams, 6 to 15 percent slopes
RV-1014	398.93	399.01	0.08	405.68	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	399.01	399.16	0.15	783.72	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1014	399.16	399.23	0.07	364.65	SD601	355430	DeC	Delridge-Cabbart loams, 6 to 15 percent slopes
RV-1014	399.23	399.31	0.08	403.73	SD601	355436	EgB	Eapa-Grail complex, 2 to 6 percent slopes
RV-1014	399.31	399.31	0.00	0.52	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1014	399.31	399.44	0.13	685.87	SD601	355436	EgB	Eapa-Grail complex, 2 to 6 percent slopes
RV-1014	399.44	399.54	0.10	539.73	SD601	355418	AsB	Assinniboine fine sandy loam, 2 to 6 percent slopes
RV-1014	399.54	399.63	0.09	470.93	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	399.63	399.69	0.07	346.04	SD601	355420	AtC	Assinniboine-Twilight fine sandy loams, 6 to 9 percent slopes
RV-1014	399.69	399.77	0.08	412.22	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	399.77	399.85	0.07	395.83	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	399.85	399.93	0.09	464.64	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	399.93	400.00	0.06	337.88	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	400.00	400.08	0.08	431.68	SD601	355428	CaD	Cabbart loam, 9 to 40 percent slopes
RV-1014	400.08	400.17	0.10	502.01	SD601	355419	AsC	Assinniboine fine sandy loam, 6 to 9 percent slopes
RV-1014	400.17	400.36	0.19	984.46	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	400.36	400.41	0.05	240.67	SD601	355423	BlE	Blackhall-Rock outcrop complex, 15 to 40 percent slopes
RV-1014	400.41	400.52	0.11	605.52	SD601	355424	BmE	Blackhall-Twilight fine sandy loams, 9 to 40 percent slopes
RV-1014	400.52	400.75	0.23	1,193.01	SD601	355430	DeC	Delridge-Cabbart loams, 6 to 15 percent slopes
RV-1014	400.75	400.78	0.04	190.39	SD601	355433	EaC	Eapa loam, 6 to 9 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
FEIS	400.78	424.02	No Change from FEIS					
RV-1015	424.02	424.17	0.14	763.62	SD601	355466	St	Stetter clay
RV-1015	424.17	424.52	0.35	1,838.43	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	424.52	424.64	0.12	627.02	SD601	355466	St	Stetter clay
RV-1015	424.64	424.69	0.06	297.50	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	424.69	424.79	0.10	508.53	SD601	355466	St	Stetter clay
RV-1015	424.79	425.06	0.27	1,431.14	SD601	355452	Lg	Lohmiller silty clay loam, channeled
RV-1015	425.06	425.10	0.04	197.08	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	425.10	425.49	0.40	2,092.65	SD601	355452	Lg	Lohmiller silty clay loam, channeled
RV-1015	425.49	425.67	0.18	934.54	SD601	355460	PsC	Pierre-Samsil clays, 6 to 15 percent slopes
RV-1015	425.67	425.72	0.05	280.69	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	425.72	426.06	0.34	1,795.36	SD601	355463	SbE	Samsil-Rock outcrop complex, 15 to 40 percent slopes
RV-1015	426.06	426.12	0.05	277.97	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	426.12	426.34	0.22	1,182.05	SD601	355463	SbE	Samsil-Rock outcrop complex, 15 to 40 percent slopes
RV-1015	426.34	426.37	0.03	165.97	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1015	426.37	426.53	0.16	829.58	SD601	355451	Ld	Lohmiller silty clay loam
FEIS	426.53	426.83	No Change from FEIS					
RV-1016	426.83	427.26	0.43	2,266.02	SD601	355462	SaD	Samsil clay, 6 to 25 percent slopes
RV-1016	427.26	427.76	0.51	2,672.30	SD601	355452	Lg	Lohmiller silty clay loam, channeled
RV-1016	427.76	428.01	0.25	1,312.83	SD601	355451	Ld	Lohmiller silty clay loam
RV-1016	428.01	428.23	0.21	1,128.21	SD601	355452	Lg	Lohmiller silty clay loam, channeled
RV-1016	428.23	428.67	0.45	2,366.03	SD601	355445	KyA	Kyle clay, 0 to 2 percent slopes
RV-1016	428.67	428.87	0.19	1,021.62	SD601	355460	PsC	Pierre-Samsil clays, 6 to 15 percent slopes
RV-1016	428.87	428.90	0.03	146.29	SD601	355445	KyA	Kyle clay, 0 to 2 percent slopes
RV-1016	428.90	429.05	0.16	831.14	SD601	355460	PsC	Pierre-Samsil clays, 6 to 15 percent slopes
RV-1016	429.05	429.09	0.03	183.88	SD601	355457	PeB	Pierre clay, 2 to 6 percent slopes
RV-1016	429.09	429.19	0.11	558.59	SD601	355452	Lg	Lohmiller silty clay loam, channeled
RV-1016	429.19	429.40	0.21	1,101.67	SD601	355451	Ld	Lohmiller silty clay loam
RV-1016	429.40	429.56	0.16	838.89	SD601	355446	KyB	Kyle clay, 2 to 6 percent slopes
RV-1016	429.56	429.67	0.11	584.84	SD601	355451	Ld	Lohmiller silty clay loam
RV-1016	429.67	429.97	0.30	1,599.88	SD601	355439	Gc	Glenberg fine sandy loam
RV-1016	429.97	430.05	0.07	395.52	SD601	355422	Bb	Bankard gravelly loamy sand
RV-1016	430.05	430.06	0.01	52.91	SD601	355477	W	Water
RV-1016	430.06	430.08	0.02	120.81	SD605	356130	W	Water
RV-1016	430.08	430.16	0.07	389.16	SD605	356101	Rv	Riverwash
RV-1016	430.16	430.23	0.07	389.83	SD605	356040	Gb	Glenberg fine sandy loam
RV-1016	430.23	430.35	0.12	647.23	SD605	356043	Ha	Haverson silt loam
RV-1016	430.35	430.50	0.15	781.12	SD605	356062	Lo	Lohmiller silty clay
RV-1016	430.50	430.72	0.22	1,148.66	SD605	356005	BaA	Baca silt loam, 0 to 4 percent slopes
RV-1016	430.72	430.85	0.13	703.98	SD605	356063	Lp	Lohmiller silty clay, channeled
RV-1016	430.86	430.90	0.04	211.19	SD055	354112	Lp	Lohmiller silty clay, channeled
RV-1016	430.90	431.00	0.10	552.11	SD055	354106	KyB	Kyle clay, 3 to 6 percent slopes
RV-1016	431.00	431.13	0.13	685.96	SD055	354141	PkE	Pierre-Samsil clays, 15 to 25 percent slopes
RV-1016	431.13	431.36	0.22	1,177.50	SD055	354155	SbF	Samsil clay, 25 to 60 percent slopes
RV-1016	431.36	431.46	0.10	533.30	SD055	354162	StF	Schamber-Samsil complex, 6 to 60 percent slopes
RV-1016	431.46	432.29	0.83	4,389.46	SD055	354094	KeA	Kirley clay loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1016	432.29	432.65	0.36	1,919.41	SD055	354153	RkD	Ree-Vivian complex, 6 to 15 percent slopes
RV-1016	432.65	432.96	0.31	1,615.36	SD055	354148	ReA	Ree loam, 0 to 2 percent slopes
RV-1016	432.96	433.10	0.14	725.69	SD055	354162	StF	Schamber-Samsil complex, 6 to 60 percent slopes
RV-1016	433.10	433.28	0.18	969.67	SD055	354155	SbF	Samsil clay, 25 to 60 percent slopes
RV-1016	433.28	433.44	0.16	849.06	SD055	354141	PkE	Pierre-Samsil clays, 15 to 25 percent slopes
RV-1016	433.44	433.54	0.10	548.12	SD055	354106	KyB	Kyle clay, 3 to 6 percent slopes
RV-1016	433.54	433.62	0.07	391.68	SD055	354112	Lp	Lohmiller silty clay, channeled
RV-1016	433.62	433.77	0.15	805.01	SD055	354106	KyB	Kyle clay, 3 to 6 percent slopes
RV-1016	433.77	434.14	0.37	1,928.80	SD055	354141	PkE	Pierre-Samsil clays, 15 to 25 percent slopes
RV-1016	434.14	434.39	0.26	1,356.97	SD055	354157	SdF	Samsil-Rock outcrop complex, 15 to 60 percent slopes
RV-1016	434.39	434.46	0.07	359.47	SD055	354162	StF	Schamber-Samsil complex, 6 to 60 percent slopes
RV-1016	434.46	436.12	1.65	8,733.89	SD055	354148	ReA	Ree loam, 0 to 2 percent slopes
FEIS	436.12	447.36	No Change from FEIS					
RV-1017	447.16	447.36	0.20	1,081.02	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1017	447.36	447.49	0.13	664.60	SD055	354104	Ko	Kolls clay
RV-1017	447.49	447.70	0.21	1,118.17	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1017	447.70	447.82	0.12	627.61	SD055	354135	OwC	Ottumwa-Lakoma silty clays, 6 to 9 percent slopes
RV-1017	447.82	448.25	0.43	2,283.39	SD055	354109	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1017	448.25	448.35	0.09	482.29	SD055	354166	Wd	Wendte-Herdcamp silty clays, channeled
RV-1017	448.35	448.42	0.07	394.27	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1017	448.42	448.45	0.03	180.47	SD055	354133	OvA	Ottumwa-Capa complex, 0 to 3 percent slopes
RV-1017	448.45	448.72	0.26	1,396.78	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1017	448.72	448.77	0.05	278.95	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
FEIS	448.77	449.60	No Change from FEIS					
RV-1018	449.60	449.63	0.03	154.24	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1018	449.63	449.76	0.13	690.24	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1018	449.76	450.13	0.37	1,960.79	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
FEIS	450.13	452.01	No Change from FEIS					
RV-1019	452.01	452.05	0.04	215.45	SD055	354135	OwC	Ottumwa-Lakoma silty clays, 6 to 9 percent slopes
RV-1019	452.05	452.50	0.45	2,384.33	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1019	452.50	452.53	0.03	139.19	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1019	452.53	452.66	0.13	702.15	SD055	354109	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1019	452.66	452.80	0.14	720.09	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1019	452.80	452.84	0.04	227.70	SD055	354133	OvA	Ottumwa-Capa complex, 0 to 3 percent slopes
RV-1019	452.84	452.90	0.06	322.33	SD055	354085	Ct	Capa-Wendte, channeled, complex
RV-1019	452.90	452.98	0.07	393.24	SD055	354109	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1019	452.98	453.00	0.02	112.29	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
FEIS	453.00	455.22	No Change from FEIS					
RV-1020	455.22	455.32	0.11	558.61	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1020	455.32	455.39	0.06	326.47	SD055	354135	OwC	Ottumwa-Lakoma silty clays, 6 to 9 percent slopes
RV-1020	455.39	455.84	0.46	2,403.43	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1020	455.84	456.35	0.51	2,703.56	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1020	456.35	456.52	0.17	878.92	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
RV-1020	456.52	456.74	0.22	1,179.19	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
FEIS	456.74	461.83	No Change from FEIS					
RV-1021	461.83	461.93	0.11	554.44	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1021	461.93	462.26	0.32	1,695.22	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1021	462.26	462.26	0.01	46.55	SD055	354134	OwB	Ottumwa-Lakoma silty clays, 3 to 6 percent slopes
FEIS	462.26	475.48	No Change from FEIS					
RV-1022	475.48	475.64	0.16	847.78	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1022	475.64	475.73	0.09	491.38	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1022	475.73	475.79	0.06	312.68	SD055	354108	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1022	475.79	475.92	0.13	687.68	SD055	354132	OtB	Ottumwa silty clay, 3 to 6 percent slopes
RV-1022	475.92	476.11	0.19	984.99	SD055	354102	KmC	Kirley-Ottumwa complex, 6 to 9 percent slopes
RV-1022	476.11	476.42	0.31	1,652.52	SD055	354101	KmB	Kirley-Ottumwa complex, 2 to 6 percent slopes
RV-1022	476.42	476.43	0.01	41.50	SD055	354122	ObE	Okaton-Lakoma silty clays, 15 to 40 percent slopes
RV-1022	476.43	476.47	0.04	231.20	SD055	354101	KmB	Kirley-Ottumwa complex, 2 to 6 percent slopes
RV-1022	476.47	476.67	0.19	1,021.92	SD055	354095	KeB	Kirley clay loam, 2 to 6 percent slopes
RV-1022	476.67	476.88	0.21	1,123.16	SD055	354110	LbE	Lakoma-Vivian complex, 9 to 25 percent slopes
RV-1022	476.88	477.10	0.22	1,167.66	SD055	354109	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1022	477.10	477.15	0.05	268.05	SD055	354085	Ct	Capa-Wendte, channeled, complex
RV-1022	477.15	477.52	0.37	1,970.03	SD055	354109	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1022	477.52	477.65	0.12	643.68	SD055	354110	LbE	Lakoma-Vivian complex, 9 to 25 percent slopes
RV-1022	477.65	477.74	0.09	488.58	SD055	354095	KeB	Kirley clay loam, 2 to 6 percent slopes
RV-1022	477.74	477.77	0.03	136.09	SD055	354094	KeA	Kirley clay loam, 0 to 2 percent slopes
FEIS	477.77	484.38	No Change from FEIS					
RV-1023	484.38	484.63	0.26	1,353.12	SD055	354103	KnD	Kirley-Vivian complex, 6 to 15 percent slopes
RV-1023	484.63	484.91	0.28	1,472.20	SD055	354162	StF	Schamber-Samsil complex, 6 to 60 percent slopes
RV-1023	484.91	485.29	0.38	2,000.62	SD055	354158	SoE	Sansarc-0pal clays, 9 to 40 percent slopes
RV-1023	485.29	485.34	0.05	238.00	SD055	354069	Ab	Albaton silty clay, depressional
RV-1023	485.34	485.45	0.12	616.11	SD055	354117	Nc	Nimbro silty clay loam, channeled
RV-1023	485.45	485.90	0.45	2,377.80	SD055	354116	Nb	Nimbro silty clay loam
RV-1023	485.90	485.96	0.06	299.97	SD055	354117	Nc	Nimbro silty clay loam, channeled
RV-1023	485.96	486.13	0.17	899.34	SD055	354077	Bu	Bullcreek clay, 0 to 6 percent slopes
FEIS	486.13	493.54	No Change from FEIS					
RV-1024	493.54	493.79	0.25	1,333.40	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1024	493.79	494.02	0.23	1,208.82	SD075	353644	LaC	Lakoma silty clay, 6 to 9 percent slopes
RV-1024	494.02	494.09	0.07	368.50	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1024	494.09	494.43	0.34	1,806.92	SD075	353634	KeB	Kirley clay loam, 2 to 6 percent slopes
RV-1024	494.43	494.69	0.26	1,348.03	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1024	494.69	494.77	0.08	417.23	SD075	353657	ObE	Okaton-Lakoma silty clays, 15 to 40 percent slopes
RV-1024	494.77	494.98	0.21	1,131.22	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
FEIS	494.98	501.75	No Change from FEIS					
RV-1025	501.75	501.89	0.14	737.15	SD075	353658	OkE	Okaton-Wendte-Bullcreek complex, 0 to 45 percent slopes
RV-1025	501.89	502.00	0.11	606.86	SD075	353636	KeD	Kirley clay loam, 9 to 15 percent slopes
RV-1025	502.00	502.08	0.08	416.97	SD075	353640	KnD	Kirley-Vivian complex, 9 to 25 percent slopes
RV-1025	502.08	502.26	0.18	942.09	SD075	353635	KeC	Kirley clay loam, 6 to 9 percent slopes
RV-1025	502.26	502.28	0.02	101.34	SD075	353640	KnD	Kirley-Vivian complex, 9 to 25 percent slopes
RV-1025	502.28	502.36	0.08	433.41	SD075	353634	KeB	Kirley clay loam, 2 to 6 percent slopes
RV-1025	502.36	502.81	0.45	2,368.29	SD075	353669	PrB	Promise clay, 3 to 6 percent slopes
RV-1025	502.81	503.09	0.28	1,458.88	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1025	503.09	503.22	0.13	702.88	SD075	353634	KeB	Kirley clay loam, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1025	503.22	503.41	0.19	997.01	SD075	353670	PrC	Promise clay, 6 to 9 percent slopes
RV-1025	503.41	503.61	0.20	1,038.39	SD075	353652	Mo	Mosher silt loam
FEIS	503.61	506.33	No Change from FEIS					
RV-1026	506.33	506.41	0.07	394.45	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1026	506.41	506.56	0.16	822.65	SD075	353670	PrC	Promise clay, 6 to 9 percent slopes
RV-1026	506.56	506.76	0.20	1,065.06	SD075	353669	PrB	Promise clay, 3 to 6 percent slopes
RV-1026	506.76	506.88	0.11	603.85	SD075	353678	SoE	Sansarc-Opal clays, 9 to 40 percent slopes
RV-1026	506.88	506.89	0.01	35.63	SD075	353665	OpD	Opal clay, 6 to 15 percent slopes
RV-1026	506.89	507.32	0.43	2,293.58	SD075	353669	PrB	Promise clay, 3 to 6 percent slopes
RV-1026	507.32	507.41	0.09	458.91	SD075	353665	OpD	Opal clay, 6 to 15 percent slopes
RV-1026	507.41	507.47	0.06	329.97	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
RV-1026	507.47	507.53	0.06	316.99	SD075	353665	OpD	Opal clay, 6 to 15 percent slopes
RV-1026	507.53	507.63	0.10	518.26	SD075	353645	LaD	Lakoma silty clay, 6 to 15 percent slopes
FEIS	507.63	534.03	No Change from FEIS					
RV-1027	534.03	534.22	0.18	974.77	SD085	355591	MmB	Millboro silty clay, 3 to 6 percent slopes
RV-1027	534.22	534.31	0.09	480.80	SD085	355593	MnC	Millboro-Boro silty clays, 6 to 9 percent slopes
RV-1027	534.31	534.42	0.12	613.33	SD085	355563	BuA	Bullcreek clay, 0 to 6 percent slopes
RV-1027	534.42	535.07	0.64	3,396.51	SD085	355591	MmB	Millboro silty clay, 3 to 6 percent slopes
FEIS	535.07	540.23	No Change from FEIS					
RV-1028	540.23	540.26	0.03	164.92	SD085	355597	OhE	Okaton-Lakoma silty clays, 15 to 40 percent slopes
RV-1028	540.26	540.96	0.70	3,669.79	SD085	355619	SbE	Sansarc-Opal clays, 9 to 40 percent slopes
RV-1028	540.96	541.03	0.07	368.66	SD085	355563	BuA	Bullcreek clay, 0 to 6 percent slopes
RV-1028	541.03	541.06	0.04	186.17	SD085	355608	PoA	Promise clay, 0 to 3 percent slopes
FEIS	541.06	542.16	No Change from FEIS					
RV-1029	542.61	542.62	0.01	46.22	SD123	354433	RaB	Ree loam, 3 to 6 percent slopes
RV-1029	542.62	542.78	0.16	831.91	SD123	354407	LwA	Lowry silt loam, 0 to 4 percent slopes
RV-1029	542.78	543.16	0.38	2,009.75	SD123	354433	RaB	Ree loam, 3 to 6 percent slopes
RV-1029	543.16	543.19	0.03	133.85	SD123	354459	WeE	Westover loam, 9 to 25 percent slopes
RV-1029	543.19	543.29	0.10	526.27	SD123	354419	OBE	Okaton-Lakoma association, 15 to 40 percent slopes
RV-1029	543.29	543.48	0.19	1,018.73	SD123	354445	SAE	Sansarc-Opal association, 15 to 40 percent slopes
RV-1029	543.48	543.70	0.22	1,148.85	SD123	354450	Sw	Bullcreek clay
RV-1029	543.70	544.00	0.30	1,572.36	SD123	354445	SAE	Sansarc-Opal association, 15 to 40 percent slopes
RV-1029	544.00	544.66	0.67	3,536.76	SD123	354419	OBE	Okaton-Lakoma association, 15 to 40 percent slopes
RV-1029	544.66	544.72	0.05	268.82	SD123	354447	ShE	Schamber-Murdo complex, 15 to 40 percent slopes
RV-1029	544.72	544.76	0.05	238.46	SD123	354459	WeE	Westover loam, 9 to 25 percent slopes
RV-1029	544.76	545.21	0.45	2,382.46	SD123	354432	RaA	Ree loam, 0 to 3 percent slopes
FEIS	545.21	547.33	No Change from FEIS					
RV-1030	547.33	547.39	0.06	323.87	SD123	354450	Sw	Bullcreek clay
RV-1030	547.39	547.48	0.09	471.33	SD123	354423	OpC	Opal clay, 3 to 9 percent slopes
RV-1030	547.48	547.66	0.18	950.37	SD123	354450	Sw	Bullcreek clay
RV-1030	547.66	547.74	0.07	387.47	SD123	354445	SAE	Sansarc-Opal association, 15 to 40 percent slopes
RV-1030	547.74	548.03	0.29	1,545.49	SD123	354419	OBE	Okaton-Lakoma association, 15 to 40 percent slopes
RV-1030	548.03	548.22	0.19	996.37	SD123	354447	ShE	Schamber-Murdo complex, 15 to 40 percent slopes
RV-1030	548.22	548.25	0.04	197.69	SD123	354419	OBE	Okaton-Lakoma association, 15 to 40 percent slopes
RV-1030	548.25	548.79	0.53	2,812.66	SD123	354434	RaC	Ree loam, 6 to 9 percent slopes
RV-1030	548.79	549.20	0.41	2,181.87	SD123	354406	LoD	Lakoma-Okaton silty clays, 9 to 15 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1030	549.20	549.23	0.03	177.74	SD123	354434	RaC	Ree loam, 6 to 9 percent slopes
FEIS	549.23	578.31		578.31				
RV-1031	578.31	578.45	0.14	726.74	SD123	354387	DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded
RV-1031	578.45	578.45	0.00	13.17	SD123	354389	Em	Elsmere fine sandy loam
RV-1031	578.45	578.52	0.06	340.14	SD123	354387	DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded
RV-1031	578.52	578.57	0.05	284.51	SD123	354389	Em	Elsmere fine sandy loam
RV-1031	578.57	578.64	0.07	350.94	SD123	354387	DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded
RV-1031	578.64	578.71	0.08	396.91	SD123	354389	Em	Elsmere fine sandy loam
RV-1031	578.71	578.77	0.05	287.90	SD123	354454	VdC	Valentine-Dunday complex, 3 to 9 percent slopes
RV-1031	578.77	578.78	0.02	86.27	SD123	354386	DmA	Doger-Elsmere complex, 0 to 3 percent slopes
RV-1031	578.78	578.82	0.03	184.31	SD123	354454	VdC	Valentine-Dunday complex, 3 to 9 percent slopes
RV-1031	578.82	578.91	0.09	476.73	SD123	354387	DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded
RV-1031	578.91	579.00	0.09	488.64	SD123	354389	Em	Elsmere fine sandy loam
FEIS	579.00	599.41		No Change from FEIS				
RV-1032	599.41	599.47	0.06	290.46	SD123	354374	BOD	Boyd-Okaton association, 9 to 25 percent slopes
RV-1032	599.47	599.53	0.06	316.71	SD123	354410	MfE	Manter-Anselmo fine sandy loams, 15 to 30 percent slopes
RV-1032	599.53	599.83	0.30	1,586.80	SD123	354374	BOD	Boyd-Okaton association, 9 to 25 percent slopes
RV-1032	599.83	599.87	0.05	248.55	SD123	354427	PrB	Promise clay, 3 to 6 percent slopes
FEIS	599.87	600.96		No Change from FEIS				
NEBRASKA								
FEIS	600.96	601.75		No Change from FEIS				
Fragile Soils Alternative	601.75	601.77	0.02	104.95	NE103	357709	3177	Holt variant fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	601.77	601.81	0.04	198.20	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	601.81	602.03	0.22	1,171.96	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	602.03	602.09	0.06	337.27	NE103	357684	8437	Cass loam, channeled, frequently flooded
Fragile Soils Alternative	602.09	602.65	0.55	2,905.22	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	602.65	602.80	0.15	805.77	NE103	357738	3213	Longpine loamy fine sand, 3 to 30 percent slopes
Fragile Soils Alternative	602.80	602.85	0.05	273.64	NE103	357734	5252	Schamber gravelly sandy loam, 9 to 30 percent slopes
Fragile Soils Alternative	602.85	602.96	0.11	558.28	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	602.96	603.00	0.04	217.12	NE103	357738	3213	Longpine loamy fine sand, 3 to 30 percent slopes
Fragile Soils Alternative	603.00	603.34	0.35	1,827.89	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	603.34	603.48	0.14	738.75	NE103	357738	3213	Longpine loamy fine sand, 3 to 30 percent slopes
Fragile Soils Alternative	603.48	603.52	0.04	215.18	NE103	357694	3173	Holt-Longpine fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	603.52	603.64	0.12	641.52	NE103	357738	3213	Longpine loamy fine sand, 3 to 30 percent slopes
Fragile Soils Alternative	603.64	603.68	0.04	185.67	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	603.68	603.74	0.06	297.32	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	603.74	603.79	0.06	304.25	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	603.79	603.82	0.02	123.85	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	603.82	603.89	0.07	374.16	NE103	357679	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	603.89	604.03	0.14	755.92	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	604.03	604.09	0.05	287.55	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	604.09	604.25	0.17	877.07	NE103	357679	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	604.25	604.32	0.07	360.50	NE103	357753	5286	Vetal loam, 1 to 3 percent slopes
Fragile Soils Alternative	604.32	604.46	0.14	733.19	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	604.46	604.48	0.02	129.25	NE103	357756	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	604.48	604.55	0.06	341.58	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	604.55	604.72	0.17	885.80	NE103	357756	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	604.72	604.77	0.05	287.28	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	604.77	605.04	0.27	1,430.99	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	605.04	605.12	0.08	410.77	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	605.12	605.17	0.05	249.41	NE103	357678	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
Fragile Soils Alternative	605.17	605.34	0.17	917.48	NE103	357679	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	605.34	605.51	0.17	872.11	NE103	357747	4893	Valentine-Wewela loamy fine sands, 6 to 30 percent slopes
Fragile Soils Alternative	605.51	605.60	0.09	497.97	NE103	357731	3312	Ronson-Anselmo fine sandy loams, 6 to 30 percent slopes
Fragile Soils Alternative	605.60	605.64	0.04	224.51	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	605.64	605.69	0.05	262.11	NE103	357696	2322	Inavale fine sand, channeled, frequently flooded
Fragile Soils Alternative	605.69	605.70	0.01	51.43	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	605.70	605.79	0.09	476.77	NE103	357734	5252	Schamber gravelly sandy loam, 9 to 30 percent slopes
Fragile Soils Alternative	605.79	605.83	0.04	217.32	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	605.83	605.86	0.03	164.84	NE103	357734	5252	Schamber gravelly sandy loam, 9 to 30 percent slopes
Fragile Soils Alternative	605.86	605.88	0.02	107.82	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	605.88	606.02	0.14	736.54	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	606.02	606.09	0.07	352.52	NE103	357727	3298	Ree loam, 0 to 2 percent slopes
Fragile Soils Alternative	606.09	606.30	0.21	1,104.53	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	606.30	606.35	0.05	287.39	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	606.35	606.39	0.04	209.69	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	606.39	606.44	0.05	238.48	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	606.44	606.49	0.05	274.47	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	606.49	606.62	0.13	671.71	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	606.62	606.90	0.28	1,499.68	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	606.90	607.06	0.16	825.31	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	607.06	607.16	0.10	525.78	NE103	357727	3298	Ree loam, 0 to 2 percent slopes
Fragile Soils Alternative	607.16	607.66	0.50	2,655.35	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	607.66	607.73	0.07	353.14	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	607.73	607.81	0.08	441.74	NE103	357684	8437	Cass loam, channeled, frequently flooded
Fragile Soils Alternative	607.81	607.86	0.05	247.20	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	607.86	608.20	0.34	1,786.15	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	608.20	608.30	0.10	526.67	NE103	357733	3320	Sansarc silty clay, 20 to 40 percent slopes
Fragile Soils Alternative	608.30	608.32	0.02	130.89	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	608.32	608.40	0.08	403.02	NE103	357733	3320	Sansarc silty clay, 20 to 40 percent slopes
Fragile Soils Alternative	608.40	608.58	0.19	979.70	NE103	357739	3214	Longpine-Duda complex, 3 to 15 percent slopes
Fragile Soils Alternative	608.58	608.70	0.11	590.03	NE103	357733	3320	Sansarc silty clay, 20 to 40 percent slopes
Fragile Soils Alternative	608.70	608.86	0.17	884.90	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	608.86	608.92	0.06	316.27	NE103	357735	8935	Simeon-Holt variant-Ronson complex, 6 to 17 percent slopes
Fragile Soils Alternative	608.92	609.13	0.21	1,101.77	NE103	357730	3311	Ronson-Anselmo fine sandy loams, 6 to 11 percent slopes
Fragile Soils Alternative	609.13	609.34	0.21	1,109.64	NE103	357747	4893	Valentine-Wewela loamy fine sands, 6 to 30 percent slopes
Fragile Soils Alternative	609.34	609.62	0.28	1,486.22	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	609.62	609.64	0.02	103.20	NE103	357733	3320	Sansarc silty clay, 20 to 40 percent slopes
Fragile Soils Alternative	609.64	609.88	0.24	1,246.13	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	609.88	610.36	0.48	2,515.06	NE103	357733	3320	Sansarc silty clay, 20 to 40 percent slopes
Fragile Soils Alternative	610.36	610.43	0.08	397.78	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	610.43	610.47	0.04	190.13	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	610.47	610.50	0.04	195.52	NE103	357734	5252	Schamber gravelly sandy loam, 9 to 30 percent slopes
Fragile Soils Alternative	610.50	610.53	0.02	121.76	NE103	357747	4893	Valentine-Wewela loamy fine sands, 6 to 30 percent slopes
Fragile Soils Alternative	610.53	610.57	0.04	206.87	NE103	357684	8437	Cass loam, channeled, frequently flooded
Fragile Soils Alternative	610.57	610.63	0.06	318.03	NE103	357750	3326	Verdel silty clay loam, 2 to 6 percent slopes
Fragile Soils Alternative	610.63	610.64	0.02	93.78	NE103	357684	8437	Cass loam, channeled, frequently flooded
Fragile Soils Alternative	610.64	610.76	0.11	588.13	NE103	357750	3326	Verdel silty clay loam, 2 to 6 percent slopes
Fragile Soils Alternative	610.76	611.09	0.33	1,744.31	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	611.09	611.17	0.09	452.24	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	611.17	611.25	0.08	422.99	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	611.25	611.48	0.23	1,232.65	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	611.48	611.57	0.08	430.95	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	611.57	611.58	0.02	87.84	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	611.58	611.64	0.06	311.30	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	611.64	611.73	0.08	440.01	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	611.73	612.04	0.32	1,687.40	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	612.04	612.35	0.30	1,600.83	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	612.35	612.43	0.09	459.58	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	612.43	612.80	0.37	1,939.41	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	612.80	612.89	0.08	448.07	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	612.89	613.36	0.47	2,494.00	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	613.36	613.48	0.12	630.62	NE103	357736	8943	Simeon-Valentine fine sands, 6 to 17 percent slopes, eroded
Fragile Soils Alternative	613.48	613.54	0.06	315.60	NE103	357679	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	613.54	613.69	0.15	806.20	NE103	357750	3326	Verdel silty clay loam, 2 to 6 percent slopes
Fragile Soils Alternative	613.69	613.76	0.07	371.01	NE103	357683	8435	Cass loam, rarely flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	613.76	613.84	0.08	408.49	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	613.84	614.31	0.47	2,496.61	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	614.31	614.44	0.12	658.27	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	614.44	615.06	0.62	3,271.85	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	615.06	615.09	0.03	182.88	NE103	357748	3325	Verdel silty clay loam, 0 to 2 percent slopes
Fragile Soils Alternative	615.09	615.40	0.31	1,618.01	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	615.40	615.43	0.03	168.43	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	615.43	615.46	0.03	143.95	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	615.46	615.69	0.24	1,257.35	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	615.69	616.17	0.47	2,488.20	NE103	357720	5220	Onita silt loam, 0 to 1 percent slopes
Fragile Soils Alternative	616.17	616.54	0.37	1,977.26	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	616.54	616.84	0.30	1,588.89	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	616.84	616.92	0.07	389.99	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	616.92	616.93	0.02	87.23	NE103	357748	3325	Verdel silty clay loam, 0 to 2 percent slopes
Fragile Soils Alternative	616.93	616.97	0.04	217.21	NE103	357684	8437	Cass loam, channeled, frequently flooded
Fragile Soils Alternative	616.97	617.02	0.05	252.57	NE103	357683	8435	Cass loam, rarely flooded
Fragile Soils Alternative	617.02	617.02	0.00	11.58	NE103	357750	3326	Verdel silty clay loam, 2 to 6 percent slopes
Fragile Soils Alternative	617.02	617.08	0.05	287.12	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	617.08	617.14	0.07	352.58	NE103	357729	3305	Reliance silt loam, 2 to 6 percent slopes
Fragile Soils Alternative	617.14	617.46	0.31	1,659.20	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	617.46	617.49	0.03	149.44	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	617.49	617.58	0.10	510.50	NE103	357703	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	617.58	617.63	0.04	227.25	NE103	357704	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	617.63	617.71	0.09	459.93	NE015	357637	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	617.71	617.74	0.02	124.12	NE015	2217486	8435	Cass loam, rarely flooded
Fragile Soils Alternative	617.74	617.82	0.08	439.02	NE015	357625	1039	Grigston silt loam, occasionally flooded
Fragile Soils Alternative	617.82	617.91	0.09	498.38	NE015	2217486	8435	Cass loam, rarely flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	617.91	617.95	0.04	211.00	NE015	357631	2110	Inavale loamy fine sand, occasionally flooded
Fragile Soils Alternative	617.95	618.04	0.09	457.03	NE015	357652	4241	Ord fine sandy loam, occasionally flooded
Fragile Soils Alternative	618.04	618.06	0.02	108.09	NE015	357629	2325	Inavale fine sand, 3 to 11 percent slopes
Fragile Soils Alternative	618.06	618.12	0.06	325.16	NE015	1034801	9999	Water
Fragile Soils Alternative	618.12	618.13	0.01	38.62	NE015	357618	3521	Cass fine sandy loam, occasionally flooded
Fragile Soils Alternative	618.13	618.21	0.08	418.21	NE015	357631	2110	Inavale loamy fine sand, occasionally flooded
Fragile Soils Alternative	618.21	618.26	0.05	248.67	NE015	357629	2325	Inavale fine sand, 3 to 11 percent slopes
Fragile Soils Alternative	618.26	618.36	0.10	539.73	NE015	357618	3521	Cass fine sandy loam, occasionally flooded
Fragile Soils Alternative	618.36	618.40	0.04	199.11	NE015	357636	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	618.40	618.56	0.16	854.81	NE015	357637	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	618.56	618.67	0.11	605.35	NE015	357621	4488	Dunday loamy fine sand, 3 to 6 percent slopes
Fragile Soils Alternative	618.67	618.76	0.09	449.85	NE015	2217485	4807	Valentine fine sand, rolling
Fragile Soils Alternative	618.76	618.88	0.12	626.10	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	618.88	619.36	0.49	2,562.86	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	619.36	619.55	0.18	973.88	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	619.55	619.63	0.08	441.45	NE015	357623	4496	Dunday loamy fine sand, loamy substratum, 0 to 3 percent slopes
Fragile Soils Alternative	619.63	619.68	0.05	259.96	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	619.68	619.75	0.07	351.70	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	619.75	619.75	0.00	21.81	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	619.75	619.84	0.09	465.46	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	619.84	619.88	0.04	221.65	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	619.88	619.93	0.05	281.92	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	619.93	620.06	0.12	645.18	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	620.06	620.15	0.09	501.15	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	620.15	620.30	0.15	801.51	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	620.30	620.38	0.07	389.94	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	620.38	620.50	0.12	650.38	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	620.50	620.63	0.13	674.93	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	620.63	620.82	0.19	998.21	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	620.82	620.90	0.09	455.60	NE015	357621	4488	Dunday loamy fine sand, 3 to 6 percent slopes
Fragile Soils Alternative	620.90	621.03	0.13	669.61	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	621.03	621.15	0.12	632.24	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	621.15	621.28	0.13	702.49	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	621.28	621.54	0.26	1,370.70	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	621.54	621.58	0.04	188.40	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	621.58	621.65	0.07	355.94	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	621.65	621.78	0.14	713.46	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	621.78	621.84	0.06	312.65	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	621.84	621.87	0.03	173.85	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	621.87	621.99	0.12	632.68	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	621.99	622.45	0.46	2,427.76	NE015	357667	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	622.45	622.80	0.35	1,822.43	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	622.80	622.90	0.10	552.90	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	622.90	623.03	0.12	653.53	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	623.03	623.14	0.12	611.07	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	623.14	623.40	0.26	1,388.30	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	623.40	623.51	0.11	567.29	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	623.51	623.66	0.15	775.11	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	623.66	623.83	0.18	927.14	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	623.83	623.92	0.09	453.05	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	623.92	624.09	0.17	923.15	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	624.09	624.23	0.14	733.73	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes
Fragile Soils Alternative	624.23	624.35	0.11	592.50	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	624.35	624.62	0.28	1,469.69	NE015	357668	8946	Simeon-Valentine loamy sands, 0 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	624.62	624.84	0.22	1,153.02	NE015	357670	4794	Valentine fine sand, 9 to 17 percent slopes
Fragile Soils Alternative	624.84	625.07	0.23	1,201.12	NE015	357620	4485	Dunday loamy fine sand, 0 to 3 percent slopes
Fragile Soils Alternative	625.07	625.15	0.08	421.98	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	625.15	625.23	0.08	410.04	NE015	357673	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	625.23	625.28	0.05	252.41	NE015	357671	4838	Valentine loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	625.28	625.39	0.11	583.07	NE015	357673	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	625.39	625.73	0.35	1,826.59	NE015	357637	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	625.73	625.76	0.03	143.29	NE015	357652	4241	Ord fine sandy loam, occasionally flooded
Fragile Soils Alternative	625.76	625.78	0.02	123.66	NE015	357632	2328	Inavale fine sandy loam, occasionally flooded
Fragile Soils Alternative	625.78	625.81	0.02	122.25	NE015	357652	4241	Ord fine sandy loam, occasionally flooded
Fragile Soils Alternative	625.81	625.85	0.04	219.13	NE015	357632	2328	Inavale fine sandy loam, occasionally flooded
Fragile Soils Alternative	625.85	625.92	0.08	402.96	NE015	357631	2110	Inavale loamy fine sand, occasionally flooded
Fragile Soils Alternative	625.92	625.99	0.06	334.53	NE015	357610	6314	Barney silt loam, channeled, frequently flooded
Fragile Soils Alternative	625.99	626.09	0.10	528.81	NE015	1034801	9999	Water
Fragile Soils Alternative	626.09	626.22	0.13	688.14	NE089	713617	9999	Water
Fragile Soils Alternative	626.22	626.23	0.01	58.11	NE089	100080	8425	Boel-Inavale complex, channeled, frequently flooded
Fragile Soils Alternative	626.23	626.43	0.20	1,072.20	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	626.43	626.48	0.05	273.64	NE089	100114	3220	Labu silty clay, 2 to 6 percent slopes
Fragile Soils Alternative	626.48	626.53	0.04	220.49	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
Fragile Soils Alternative	626.53	626.58	0.05	286.92	NE089	100114	3220	Labu silty clay, 2 to 6 percent slopes
Fragile Soils Alternative	626.58	626.64	0.06	340.70	NE089	100115	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	626.64	626.77	0.13	675.95	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	626.77	626.86	0.09	475.20	NE089	100079	8422	Boel silty clay loam, overwash, occasionally flooded
Fragile Soils Alternative	626.86	626.99	0.13	661.28	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	626.99	627.03	0.04	225.85	NE089	100142	3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes
Fragile Soils Alternative	627.03	627.34	0.31	1,638.49	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
Fragile Soils Alternative	627.34	627.38	0.04	213.05	NE089	100156	8925	Simeon loamy sand, 0 to 3 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	627.38	627.95	0.57	3,005.23	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
Fragile Soils Alternative	627.95	628.06	0.11	597.91	NE089	100169	4882	Valentine-Simeon sands, 9 to 30 percent slopes, eroded
Fragile Soils Alternative	628.06	628.22	0.16	827.99	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
Fragile Soils Alternative	628.22	628.27	0.05	256.09	NE089	100138	3261	O'Neill fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	628.27	628.68	0.41	2,188.44	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
Fragile Soils Alternative	628.68	628.71	0.03	168.96	NE089	100175	3342	Wewela loam, 0 to 2 percent slopes
Fragile Soils Alternative	628.71	628.77	0.06	311.76	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
Fragile Soils Alternative	628.77	629.52	0.74	3,920.31	NE089	100175	3342	Wewela loam, 0 to 2 percent slopes
Fragile Soils Alternative	629.52	629.56	0.04	215.06	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	629.56	629.85	0.29	1,537.27	NE089	100175	3342	Wewela loam, 0 to 2 percent slopes
Fragile Soils Alternative	629.85	629.85	0.00	18.00	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
Fragile Soils Alternative	629.85	629.86	0.01	58.92	NE089	100174	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	629.86	630.17	0.31	1,633.40	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
Fragile Soils Alternative	630.17	630.52	0.35	1,858.29	NE089	100173	3340	Wewela fine sandy loam, 0 to 2 percent slopes
Fragile Soils Alternative	630.52	630.65	0.13	678.99	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
Fragile Soils Alternative	630.65	630.88	0.23	1,215.17	NE089	100096	4557	Elsmere loamy fine sand, clayey substratum, 0 to 3 percent slopes
Fragile Soils Alternative	630.88	631.00	0.11	596.97	NE089	100124	4662	Loup fine sandy loam, 0 to 1 percent slopes
Fragile Soils Alternative	631.00	631.14	0.15	780.82	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	631.14	631.26	0.12	625.04	NE089	100138	3261	O'Neill fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	631.26	631.40	0.14	727.50	NE089	100143	4243	Ord loam, rarely flooded
Fragile Soils Alternative	631.40	631.48	0.08	439.85	NE089	100083	6642	Boelus loamy sand, 6 to 11 percent slopes
Fragile Soils Alternative	631.48	631.56	0.08	428.09	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
Fragile Soils Alternative	631.56	631.71	0.15	785.15	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	631.71	631.84	0.12	647.97	NE089	100114	3220	Labu silty clay, 2 to 6 percent slopes
Fragile Soils Alternative	631.84	631.91	0.07	380.19	NE089	100072	9020	Anselmo-O'Neill sandy loams, 3 to 6 percent slopes
Fragile Soils Alternative	631.91	631.96	0.05	257.01	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	631.96	632.02	0.07	344.22	NE089	100174	3341	Wewela fine sandy loam, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	632.02	632.06	0.04	195.94	NE089	100115	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	632.06	632.15	0.09	474.86	NE089	100174	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	632.15	632.32	0.18	927.43	NE089	100115	3221	Labu silty clay, 6 to 11 percent slopes
Fragile Soils Alternative	632.32	632.62	0.29	1,542.17	NE089	100174	3341	Wewela fine sandy loam, 2 to 6 percent slopes
Fragile Soils Alternative	632.62	632.65	0.04	195.49	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	632.65	632.72	0.07	363.89	NE089	100080	8425	Boel-Inavale complex, channeled, frequently flooded
Fragile Soils Alternative	632.72	632.75	0.03	134.20	NE089	100114	3220	Labu silty clay, 2 to 6 percent slopes
Fragile Soils Alternative	632.75	632.80	0.05	259.33	NE089	100116	3225	Labu-Sansarc silty clays, 11 to 30 percent slopes
Fragile Soils Alternative	632.80	632.84	0.05	253.37	NE089	100175	3342	Wewela loam, 0 to 2 percent slopes
Fragile Soils Alternative	632.84	633.05	0.20	1,065.01	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
Fragile Soils Alternative	633.05	633.17	0.12	627.72	NE089	100090	4498	Dunday loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	633.17	634.15	0.98	5,185.43	NE089	100156	8925	Simeon loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	634.15	634.47	0.32	1,705.10	NE089	100098	4560	Elsmere-Ipage loamy fine sands, 0 to 3 percent slopes
Fragile Soils Alternative	634.47	634.60	0.13	678.82	NE089	100082	6641	Boelus loamy sand, 3 to 6 percent slopes
Fragile Soils Alternative	634.60	634.70	0.11	558.37	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
Fragile Soils Alternative	634.70	634.94	0.23	1,222.70	NE089	100095	4553	Elsmere loamy fine sand, 0 to 3 percent slopes
Fragile Soils Alternative	634.94	635.08	0.14	751.00	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	635.08	635.28	0.20	1,059.43	NE089	100125	4669	Loup fine sandy loam, frequently ponded
Fragile Soils Alternative	635.28	635.47	0.19	1,007.93	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
Fragile Soils Alternative	635.47	635.72	0.25	1,311.31	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
Fragile Soils Alternative	635.72	635.76	0.05	241.66	NE089	100162	4791	Valentine fine sand, 3 to 9 percent slopes
Fragile Soils Alternative	635.76	636.01	0.25	1,320.37	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
Fragile Soils Alternative	636.01	636.07	0.05	289.51	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
Fragile Soils Alternative	636.07	636.27	0.20	1,044.83	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
Fragile Soils Alternative	636.27	636.35	0.08	447.90	NE089	100082	6641	Boelus loamy sand, 3 to 6 percent slopes
Fragile Soils Alternative	636.35	636.54	0.19	1,014.21	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
Fragile Soils Alternative	636.54	636.61	0.06	332.95	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Fragile Soils Alternative	636.61	637.42	0.81	4,296.81	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	637.42	637.45	0.03	157.74	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	637.45	637.55	0.10	522.45	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	637.55	637.71	0.16	855.02	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	637.71	637.86	0.15	768.37	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	637.86	638.21	0.36	1,876.95	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	638.21	638.78	0.57	3,001.50	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	638.78	639.02	0.24	1,255.20	NE089	100112	3205	Josburg fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	639.02	639.23	0.21	1,107.95	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	639.23	639.36	0.13	667.37	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	639.36	639.70	0.35	1,822.47	NE089	100095	4553	Elsmere loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	639.70	639.77	0.07	392.29	NE089	100124	4662	Loup fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	639.77	639.89	0.12	622.74	NE089	100095	4553	Elsmere loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	639.89	640.02	0.12	652.76	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	640.02	640.04	0.03	145.48	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.04	640.06	0.01	77.05	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	640.06	640.10	0.05	237.84	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.10	640.22	0.11	590.05	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.22	640.31	0.10	514.73	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	640.31	640.34	0.03	136.15	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.34	640.38	0.04	218.35	NE089	100095	4553	Elsmere loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.38	640.43	0.05	245.32	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.43	640.51	0.08	441.23	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	640.51	640.62	0.11	563.31	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	640.62	640.70	0.09	448.98	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	640.70	640.83	0.13	693.94	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	640.83	640.93	0.10	501.65	NE089	100098	4560	Elsmere-Ipage loamy fine sands, 0 to 3 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	640.93	640.94	0.01	69.03	NE089	100095	4553	Elsmere loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.94	640.96	0.02	112.17	NE089	100098	4560	Elsmere-Ipage loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	640.96	641.13	0.16	865.47	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	641.13	641.18	0.05	262.46	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	641.18	641.23	0.05	279.21	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	641.23	641.28	0.05	269.28	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	641.28	641.83	0.55	2,885.79	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	641.83	642.01	0.18	962.80	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	642.01	642.10	0.09	500.79	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	642.10	642.13	0.03	142.24	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	642.13	642.29	0.16	841.81	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	642.29	642.34	0.05	289.30	NE089	100138	3261	O'Neill fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	642.34	642.41	0.07	359.95	NE089	100090	4498	Dunday loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	642.41	642.55	0.13	703.96	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	642.55	642.64	0.09	490.32	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	642.64	642.65	0.01	75.24	NE089	100152	4722	Pivot loamy sand, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	642.65	642.79	0.14	745.01	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	642.79	642.84	0.05	245.35	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	642.84	642.90	0.06	339.17	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	642.90	643.04	0.13	712.23	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	643.04	643.12	0.08	440.56	NE089	100081	6640	Boelus loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	643.12	643.59	0.47	2,465.42	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	643.59	643.69	0.10	536.49	NE089	100081	6640	Boelus loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	643.69	644.02	0.33	1,756.72	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	644.02	644.03	0.00	12.47	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	644.03	644.08	0.05	270.10	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	644.08	644.21	0.13	695.98	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	644.21	644.32	0.11	588.46	NE089	100136	3266	O'Neill loamy sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	644.32	645.26	0.94	4,968.79	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	645.26	645.42	0.16	844.09	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	645.42	645.55	0.13	691.11	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	645.55	645.70	0.15	797.00	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	645.70	646.56	0.86	4,543.18	NE089	100136	3266	O'Neill loamy sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	646.56	646.76	0.19	1,006.42	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	646.76	646.79	0.04	186.40	NE089	100091	4499	Dunday loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	646.79	646.85	0.06	336.90	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	646.85	646.89	0.03	184.55	NE089	100091	4499	Dunday loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	646.89	647.54	0.65	3,435.99	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	647.54	647.72	0.18	962.88	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	647.72	648.04	0.32	1,679.57	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	648.04	648.07	0.03	134.75	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	648.07	648.30	0.23	1,230.32	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	648.30	648.73	0.43	2,257.36	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	648.73	648.99	0.26	1,368.92	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	648.99	649.02	0.04	191.15	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	649.02	649.30	0.27	1,446.87	NE089	100088	6662	Brunswick-Longpine fine sandy loams, 11 to 40 percent slopes
APRIL ROUTE ALTERNATIVE	649.30	649.34	0.04	218.05	NE089	100080	8425	Boel-Inavale complex, channeled, frequently flooded
APRIL ROUTE ALTERNATIVE	649.34	649.45	0.11	591.44	NE089	100071	8807	Anselmo-O'Neill sandy loams, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	649.45	649.46	0.01	45.31	NE089	100088	6662	Brunswick-Longpine fine sandy loams, 11 to 40 percent slopes
APRIL ROUTE ALTERNATIVE	649.46	649.88	0.42	2,239.22	NE089	100169	4882	Valentine-Simeon sands, 9 to 30 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	649.88	650.32	0.44	2,332.70	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	650.32	650.41	0.08	435.45	NE089	100169	4882	Valentine-Simeon sands, 9 to 30 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	650.41	650.59	0.19	977.76	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	650.59	650.62	0.03	148.48	NE089	100149	3287	Paka loam, 6 to 11 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	650.62	650.65	0.03	135.49	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	650.65	650.71	0.06	322.71	NE089	100149	3287	Paka loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	650.71	650.80	0.10	502.03	NE089	100148	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	650.80	650.97	0.17	901.25	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	650.97	651.18	0.21	1,112.37	NE089	100148	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	651.18	651.70	0.52	2,723.34	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	651.70	651.87	0.17	905.26	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	651.87	651.91	0.04	190.34	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	651.91	651.98	0.08	413.00	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	651.98	652.11	0.12	655.34	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	652.11	652.16	0.05	283.07	NE089	100091	4499	Dunday loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	652.16	652.18	0.02	109.92	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	652.18	652.24	0.06	318.13	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	652.24	652.43	0.18	965.78	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	652.43	652.60	0.17	905.32	NE089	100090	4498	Dunday loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	652.60	652.69	0.09	488.64	NE089	100142	3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	652.69	652.76	0.07	365.31	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	652.76	652.90	0.14	721.93	NE089	100142	3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	652.90	652.99	0.09	498.61	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	652.99	653.05	0.06	328.17	NE089	100142	3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	653.05	653.15	0.09	488.34	NE089	100103	2346	Inavale sand, channeled, frequently flooded
APRIL ROUTE ALTERNATIVE	653.15	653.18	0.04	203.52	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	653.18	653.26	0.07	388.35	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	653.26	653.32	0.06	310.99	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	653.32	653.36	0.04	222.58	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	653.36	653.43	0.08	398.50	NE089	100149	3287	Paka loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	653.43	653.49	0.06	300.01	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	653.49	653.62	0.13	661.37	NE089	100148	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	653.62	653.65	0.03	157.73	NE089	100149	3287	Paka loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	653.65	653.73	0.09	457.31	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	653.73	653.84	0.11	571.22	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	653.84	654.04	0.20	1,051.89	NE089	100147	3285	Paka loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	654.04	654.06	0.03	132.68	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	654.06	654.67	0.60	3,180.86	NE089	100110	3184	Jansen loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	654.67	656.26	1.60	8,433.23	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	656.26	656.60	0.34	1,786.27	NE089	100110	3184	Jansen loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	656.60	657.32	0.71	3,769.94	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.32	657.46	0.15	767.73	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.46	657.59	0.13	665.20	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.59	657.70	0.11	570.64	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.70	657.86	0.17	878.01	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.86	657.90	0.04	214.97	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	657.90	657.93	0.03	150.83	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1034	657.93	658.23	0.30	1,566.95	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1034	658.23	658.44	0.21	1,092.01	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	658.44	658.47	0.04	204.01	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	658.47	658.57	0.10	511.38	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	658.57	658.61	0.04	214.35	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	658.61	658.74	0.13	687.61	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	658.74	658.79	0.04	236.10	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	658.79	658.85	0.07	350.61	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	658.85	659.04	0.18	975.84	NE089	100110	3184	Jansen loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	659.04	659.08	0.05	241.05	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
RV-1035	659.08	659.12	0.03	169.56	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
RV-1035	659.12	659.18	0.06	342.22	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
RV-1035	659.18	659.23	0.05	268.07	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1035	659.23	659.31	0.08	408.90	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1035	659.31	659.46	0.15	797.82	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1035	659.46	659.55	0.09	462.56	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1035	659.55	659.60	0.05	258.27	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1035	659.60	659.90	0.30	1,606.25	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1035	659.90	660.05	0.15	783.50	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1035	660.05	660.20	0.15	811.80	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1035	660.20	660.72	0.52	2,751.16	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1035	660.72	660.80	0.07	395.89	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1035	660.80	660.83	0.03	182.03	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	660.83	661.10	0.27	1,419.20	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	661.10	661.31	0.21	1,090.91	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	661.31	661.36	0.05	263.52	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	661.36	661.59	0.23	1,224.27	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	661.59	661.70	0.11	558.10	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	661.70	661.81	0.12	613.46	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	661.81	661.82	0.00	23.98	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	661.82	661.84	0.03	146.47	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	661.84	661.91	0.06	323.50	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1036	661.91	662.02	0.12	624.78	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	662.02	662.09	0.06	338.06	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1036	662.09	662.16	0.07	360.13	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
RV-1036	662.16	662.26	0.11	555.01	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	662.26	662.51	0.25	1,308.36	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
RV-1036	662.51	662.63	0.12	659.24	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	662.63	662.78	0.15	784.52	NE089	100138	3261	O'Neill fine sandy loam, 2 to 6 percent slopes
RV-1036	662.78	662.87	0.09	474.91	NE089	100103	2346	Inavale sand, channeled, frequently flooded
RV-1036	662.87	662.96	0.09	453.86	NE089	1151471	9905	Fluvaquents, sandy-Fluvaquents, loamy complex, frequently flooded
RV-1036	662.96	663.03	0.07	388.30	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
RV-1036	663.03	663.10	0.07	383.02	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
RV-1036	663.10	663.22	0.11	598.41	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
RV-1036	663.22	663.32	0.10	520.41	NE089	100131	3255	Meadin sandy loam, 2 to 30 percent slopes
RV-1036	663.32	663.75	0.43	2,295.84	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	663.75	663.78	0.03	169.24	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	663.78	663.88	0.10	509.90	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	663.88	663.99	0.11	595.50	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	663.99	664.15	0.15	816.67	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	664.15	664.26	0.12	610.41	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	664.26	664.48	0.22	1,157.87	NE089	100111	3193	Jansen-Meadin loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	664.48	664.53	0.05	250.83	NE089	100089	3710	Cass fine sandy loam, rarely flooded
APRIL ROUTE ALTERNATIVE	664.53	664.68	0.15	784.67	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	664.68	664.79	0.11	571.66	NE089	100138	3261	O'Neill fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	664.79	664.93	0.14	760.71	NE089	100141	3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	664.93	665.09	0.16	863.49	NE089	100140	3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	665.09	665.44	0.34	1,819.19	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
RV-1037	665.44	665.55	0.11	600.98	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
RV-1037	665.55	665.87	0.32	1,688.49	NE089	100139	3264	O'Neill loam, 0 to 2 percent slopes
RV-1037	665.87	665.92	0.05	251.19	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
RV-1037	665.92	666.03	0.11	573.22	NE089	100132	3245	Meadin loam, 0 to 2 percent slopes
RV-1037	666.03	666.34	0.31	1,625.02	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
RV-1037	666.34	666.41	0.08	404.50	NE089	100109	3183	Jansen loam, 0 to 2 percent slopes
RV-1037	666.41	667.27	0.85	4,513.42	NE089	100137	3260	O'Neill fine sandy loam, 0 to 2 percent slopes
RV-1037	667.27	667.36	0.09	464.40	NE089	100084	6643	Boelus loamy sand, gravelly substratum, 0 to 3 percent slopes
RV-1037	667.36	667.43	0.07	369.13	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
RV-1037	667.43	667.47	0.05	247.97	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.47	667.51	0.04	187.68	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.51	667.61	0.10	543.23	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.61	667.63	0.02	79.95	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.63	667.64	0.01	50.42	NE089	100166	4857	Valentine-Dunday loamy fine sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	667.64	667.73	0.10	504.70	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.73	667.80	0.07	348.01	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.80	667.89	0.10	505.67	NE089	100084	6643	Boelus loamy sand, gravelly substratum, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.89	667.99	0.09	491.42	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	667.99	668.03	0.04	235.27	NE089	100084	6643	Boelus loamy sand, gravelly substratum, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.03	668.37	0.34	1,807.82	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.37	668.41	0.04	204.37	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.41	668.49	0.08	411.78	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.49	668.56	0.07	349.57	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	668.56	668.61	0.05	265.74	NE089	100130	3252	Meadin sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	668.61	668.75	0.14	749.21	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.75	668.91	0.16	849.42	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	668.91	669.04	0.13	674.38	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	669.04	669.77	0.74	3,893.72	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	669.77	670.40	0.62	3,288.34	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	670.40	670.54	0.14	751.05	NE089	100107	4650	Ipage loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	670.54	670.63	0.09	497.06	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	670.63	670.85	0.22	1,135.28	NE089	100084	6643	Boelus loamy sand, gravelly substratum, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	670.85	670.89	0.04	224.43	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	670.89	671.06	0.17	908.55	NE089	100084	6643	Boelus loamy sand, gravelly substratum, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	671.06	671.20	0.14	739.10	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	671.20	671.62	0.41	2,180.71	NE089	100081	6640	Boelus loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	671.62	671.71	0.09	481.31	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	671.71	672.43	0.72	3,805.17	NE089	100081	6640	Boelus loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	672.43	672.49	0.06	308.78	NE089	100151	4721	Pivot loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	672.49	672.55	0.06	330.93	NE089	100092	4512	Dunn loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	672.55	672.89	0.34	1,820.82	NE089	100090	4498	Dunday loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	672.89	672.95	0.06	313.42	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	672.95	673.05	0.09	501.27	NE089	100165	4871	Valentine-Dunday loamy fine sands, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	673.05	673.26	0.21	1,131.71	NE089	100113	3206	Josburg loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	673.26	673.33	0.07	359.22	NE089	100166	4857	Valentine-Dunday loamy fine sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	673.33	673.48	0.15	777.90	NE089	100090	4498	Dunday loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	673.48	673.68	0.20	1,067.39	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	673.68	673.73	0.05	290.31	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	673.73	673.75	0.01	76.46	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	673.75	674.20	0.45	2,394.25	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	674.20	674.28	0.08	396.28	NE089	100143	4243	Ord loam, rarely flooded
APRIL ROUTE ALTERNATIVE	674.28	674.39	0.11	585.92	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	674.39	674.42	0.03	149.26	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	674.42	674.48	0.06	326.10	NE089	100068	9001	Anselmo fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	674.48	674.56	0.08	406.84	NE089	100113	3206	Josburg loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	674.56	674.59	0.04	205.08	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	674.59	674.64	0.05	265.27	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	674.64	674.69	0.05	247.63	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	674.69	674.84	0.15	779.35	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	674.84	674.93	0.09	463.70	NE089	100113	3206	Josburg loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	674.93	675.24	0.31	1,659.58	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	675.24	675.32	0.07	389.64	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	675.32	675.52	0.20	1,069.60	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	675.52	675.60	0.09	450.95	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	675.60	675.66	0.05	276.51	NE089	100113	3206	Josburg loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	675.66	675.93	0.28	1,460.87	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	675.93	675.98	0.05	240.53	NE089	100070	9010	Anselmo loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	675.98	676.20	0.22	1,173.63	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	676.20	676.32	0.11	606.72	NE089	100146	3284	Paka fine sandy loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	676.32	676.87	0.56	2,951.12	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	676.87	676.98	0.11	558.83	NE089	100149	3287	Paka loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	676.98	677.34	0.36	1,923.26	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	677.34	677.46	0.12	623.16	NE089	100091	4499	Dunday loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	677.46	677.59	0.13	678.90	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	677.59	677.66	0.07	351.54	NE089	100074	6613	Bazile silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	677.66	677.79	0.13	676.79	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	677.79	677.90	0.11	601.12	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	677.90	677.94	0.04	218.36	NE089	100074	6613	Bazile silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	677.94	678.02	0.08	440.33	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.02	678.14	0.12	611.69	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.14	678.21	0.07	368.00	NE089	100074	6613	Bazile silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.21	678.34	0.13	684.05	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.34	678.45	0.12	607.66	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.45	678.47	0.02	105.65	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.47	678.49	0.02	98.16	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.49	678.58	0.09	477.01	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.58	678.69	0.11	563.52	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.69	678.73	0.04	186.16	NE089	100069	9004	Anselmo fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.73	678.81	0.08	447.85	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	678.81	678.89	0.08	420.89	NE089	100157	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	678.89	678.98	0.09	458.47	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	678.98	679.02	0.04	230.10	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	679.02	679.11	0.09	469.32	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	679.11	679.29	0.18	967.70	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	679.29	679.38	0.09	472.13	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	679.38	679.66	0.27	1,448.10	NE089	100074	6613	Bazile silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	679.66	679.79	0.13	702.10	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	679.79	679.84	0.06	291.18	NE089	100083	6642	Boelus loamy sand, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	679.84	679.89	0.05	265.15	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	679.89	679.94	0.05	267.51	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	679.94	679.98	0.03	184.50	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	679.98	680.00	0.02	108.87	NE089	100126	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	680.00	680.09	0.09	498.14	NE089	100089	3710	Cass fine sandy loam, rarely flooded
APRIL ROUTE ALTERNATIVE	680.09	680.13	0.04	211.78	NE089	100126	6320	Barney-Boel-Calamus complex, channeled

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	680.13	680.19	0.06	315.98	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	680.19	680.22	0.02	121.54	NE089	100082	6641	Boelus loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.22	680.38	0.16	861.25	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	680.38	680.44	0.05	289.79	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.44	680.47	0.04	195.80	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	680.47	680.51	0.04	212.02	NE089	100080	8425	Boel-Inavale complex, channeled, frequently flooded
APRIL ROUTE ALTERNATIVE	680.51	680.56	0.05	260.05	NE089	100087	6665	Brunswick-Pivot complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	680.56	680.66	0.10	514.38	NE089	100168	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	680.66	680.72	0.06	313.04	NE089	100075	6615	Bazile silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.72	680.76	0.04	218.02	NE089	100081	6640	Boelus loamy sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	680.76	680.79	0.03	142.01	NE089	100082	6641	Boelus loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.79	680.90	0.11	582.77	NE003	2215968	6641	Boelus loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.90	680.93	0.03	164.02	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	680.93	680.99	0.06	301.60	NE003	2215968	6641	Boelus loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	680.99	681.04	0.05	264.78	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.04	681.11	0.08	407.86	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	681.11	681.34	0.22	1,179.82	NE003	2215968	6641	Boelus loamy sand, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.34	681.39	0.06	306.83	NE003	2215953	4881	Valentine-Simeon sands, 3 to 9 percent slopes
APRIL ROUTE ALTERNATIVE	681.39	681.49	0.09	488.69	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.49	681.70	0.21	1,105.65	NE003	426927	6604	Bazile complex, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	681.70	681.71	0.01	74.92	NE003	426926	6605	Bazile loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.71	681.76	0.05	273.87	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	681.76	681.81	0.05	251.52	NE003	426926	6605	Bazile loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.81	681.88	0.07	388.53	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	681.88	681.92	0.03	168.67	NE003	426926	6605	Bazile loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	681.92	681.99	0.07	369.18	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	681.99	682.03	0.04	215.97	NE003	426925	6500	Bazile loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	682.03	682.23	0.20	1,074.36	NE003	426928	6607	Bazile complex, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	682.23	682.43	0.20	1,049.17	NE003	426926	6605	Bazile loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	682.43	682.48	0.05	249.58	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	682.48	682.60	0.12	635.56	NE003	426998	3282	Paka complex, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	682.60	682.87	0.28	1,453.72	NE003	426995	3287	Paka loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	682.87	683.02	0.15	804.02	NE003	426997	3281	Paka complex, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	683.02	683.05	0.03	160.71	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	683.05	683.09	0.04	197.31	NE003	1152523	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	683.09	683.22	0.12	657.14	NE003	1152524	4215	Blackloup loam, rarely flooded
APRIL ROUTE ALTERNATIVE	683.22	683.24	0.02	103.71	NE003	1152523	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	683.24	683.26	0.03	136.44	NE003	654007	9905	Fluvaquents, sandy-Fluvaquents, loamy complex, frequently flooded
APRIL ROUTE ALTERNATIVE	683.26	683.28	0.02	113.11	NE003	1152523	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	683.28	683.41	0.13	667.10	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	683.41	683.44	0.03	135.35	NE003	1152523	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	683.44	683.44	0.00	25.76	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	683.44	683.47	0.03	178.44	NE003	1152523	6320	Barney-Boel-Calamus complex, channeled
APRIL ROUTE ALTERNATIVE	683.47	683.50	0.03	135.53	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	683.50	683.58	0.08	423.75	NE003	426998	3282	Paka complex, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	683.58	683.59	0.01	44.13	NE003	426928	6607	Bazile complex, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	683.59	683.62	0.03	148.68	NE003	426998	3282	Paka complex, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	683.62	683.97	0.36	1,878.65	NE003	426928	6607	Bazile complex, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	683.97	684.11	0.14	749.84	NE003	426925	6500	Bazile loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	684.11	684.23	0.12	614.68	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	684.23	684.27	0.04	208.73	NE003	426926	6605	Bazile loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	684.27	684.35	0.08	401.19	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	684.35	684.37	0.02	127.77	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	684.37	684.61	0.24	1,274.70	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	684.61	684.65	0.04	221.22	NE003	426993	3285	Paka loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	684.65	684.80	0.14	756.34	NE003	426997	3281	Paka complex, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	684.80	684.81	0.01	44.21	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	684.81	684.83	0.02	126.66	NE003	426930	6508	Blendon fine sandy loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	684.83	684.88	0.05	284.78	NE003	426987	6845	Ortello fine sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	684.88	684.91	0.03	146.06	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	684.91	684.97	0.06	307.47	NE003	1152522	4236	Calamus-Boel complex, channeled, rarely flooded
APRIL ROUTE ALTERNATIVE	684.97	685.00	0.03	166.08	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	685.00	685.04	0.04	223.38	NE003	426969	6792	Loretto loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	685.04	685.08	0.03	172.04	NE003	426936	6660	Brunswick-Paka complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	685.08	685.12	0.04	209.02	NE003	1152522	4236	Calamus-Boel complex, channeled, rarely flooded
APRIL ROUTE ALTERNATIVE	685.12	685.18	0.06	319.58	NE003	427010	4878	Valentine-Simeon complex, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	685.18	685.37	0.20	1,045.09	NE003	426973	3255	Meadin sandy loam, 2 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	685.37	685.66	0.29	1,532.37	NE003	426994	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	685.66	685.80	0.14	717.13	NE003	426993	3285	Paka loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	685.80	685.86	0.06	310.65	NE003	426994	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	685.86	685.88	0.02	90.51	NE003	426998	3282	Paka complex, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	685.88	686.00	0.12	659.05	NE003	426997	3281	Paka complex, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	686.00	686.09	0.09	495.06	NE003	426994	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	686.09	686.15	0.06	315.67	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	686.15	686.21	0.06	293.84	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	686.21	686.26	0.05	274.54	NE003	427006	6575	Trent silt loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	686.26	686.34	0.07	395.20	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	686.34	686.53	0.19	1,006.89	NE003	426997	3281	Paka complex, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	686.53	686.72	0.19	1,027.31	NE003	427010	4878	Valentine-Simeon complex, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	686.72	686.92	0.20	1,068.75	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	686.92	687.08	0.16	845.97	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	687.08	687.24	0.15	802.42	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.24	687.29	0.06	294.43	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	687.29	687.33	0.04	188.06	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.33	687.36	0.03	148.79	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.36	687.41	0.05	260.53	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.41	687.47	0.06	342.70	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	687.47	687.54	0.07	359.03	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.54	687.59	0.05	280.59	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	687.59	687.61	0.01	75.45	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.61	687.64	0.03	181.55	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	687.64	687.73	0.09	479.52	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.73	687.81	0.08	441.70	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	687.81	687.86	0.05	246.33	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	687.86	687.95	0.09	458.03	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	687.95	688.01	0.06	313.96	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	688.01	688.05	0.04	215.66	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.05	688.08	0.03	172.50	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	688.08	688.19	0.10	550.91	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.19	688.22	0.04	210.06	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	688.22	688.50	0.28	1,459.42	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.50	688.59	0.09	490.38	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	688.59	688.65	0.06	306.04	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.65	688.87	0.22	1,156.54	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.87	688.90	0.03	145.48	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.90	688.97	0.07	360.18	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	688.97	689.14	0.17	917.02	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	689.14	689.18	0.04	234.19	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	689.18	689.23	0.05	263.77	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	689.23	689.27	0.04	209.74	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	689.27	689.44	0.16	848.53	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	689.44	689.58	0.15	788.31	NE003	426968	6791	Loretto loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	689.58	689.61	0.03	154.59	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	689.61	689.68	0.06	338.69	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	689.68	689.69	0.01	73.70	NE003	426996	3280	Paka complex, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	689.69	689.81	0.12	645.86	NE003	426994	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	689.81	689.91	0.10	504.25	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	689.91	689.92	0.01	61.36	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	689.92	690.14	0.21	1,132.83	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	690.14	690.23	0.09	499.92	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	690.23	690.37	0.14	761.64	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	690.37	690.39	0.02	101.79	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	690.39	690.54	0.15	766.26	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	690.54	690.65	0.11	585.10	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	690.65	690.92	0.27	1,409.94	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	690.92	690.96	0.05	237.94	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	690.96	691.02	0.05	284.28	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	691.02	691.06	0.04	231.25	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.06	691.18	0.12	618.58	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	691.18	691.22	0.05	248.67	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.22	691.31	0.09	461.74	NE003	426994	3286	Paka loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	691.31	691.41	0.10	519.10	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.41	691.48	0.07	375.34	NE003	426968	6791	Loretto loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	691.48	691.53	0.05	251.80	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.53	691.64	0.11	593.92	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	691.64	691.71	0.07	363.48	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.71	691.81	0.10	519.60	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	691.81	691.93	0.12	644.65	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	691.93	692.21	0.28	1,487.89	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	692.21	692.29	0.07	391.15	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	692.29	692.34	0.05	278.24	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	692.34	692.37	0.03	145.82	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	692.37	692.67	0.30	1,584.93	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	692.67	692.72	0.05	281.39	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	692.72	692.83	0.11	576.46	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	692.83	692.88	0.05	247.61	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	692.88	692.98	0.10	523.96	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	692.98	693.02	0.05	259.87	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	693.02	693.13	0.11	562.40	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	693.13	693.22	0.09	460.33	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	693.22	693.26	0.05	243.86	NE003	426968	6791	Loretto loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	693.26	693.35	0.08	425.94	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	693.35	693.43	0.09	470.40	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	693.43	693.86	0.43	2,257.33	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	693.86	694.00	0.14	730.61	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	694.00	694.02	0.02	104.77	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.02	694.08	0.05	289.80	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.08	694.20	0.12	644.74	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.20	694.25	0.05	280.62	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	694.25	694.49	0.24	1,250.24	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.49	694.52	0.04	199.47	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.52	694.56	0.04	200.47	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	694.56	694.67	0.11	590.53	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.67	694.70	0.03	149.71	NE003	427001	6725	Thurman fine sand, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	694.70	694.82	0.12	636.04	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.82	694.83	0.01	39.47	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.83	694.96	0.13	695.31	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	694.96	695.26	0.30	1,589.02	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	695.26	695.36	0.10	518.98	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	695.36	695.40	0.03	178.18	NE003	426968	6791	Loretto loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	695.40	695.54	0.15	772.66	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	695.54	695.61	0.07	375.45	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	695.61	695.64	0.03	167.68	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	695.64	695.73	0.08	446.50	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	695.73	695.81	0.08	435.55	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	695.81	695.84	0.02	128.06	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	695.84	695.90	0.07	358.93	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	695.90	695.94	0.04	201.28	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	695.94	696.07	0.13	689.23	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	696.07	696.14	0.07	362.29	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	696.14	696.23	0.09	465.79	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	696.23	696.35	0.12	634.63	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	696.35	696.41	0.06	307.69	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	696.41	696.52	0.12	609.62	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	696.52	696.56	0.04	210.79	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	696.56	696.62	0.05	284.18	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	696.62	696.65	0.04	189.15	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	696.65	696.71	0.05	282.40	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	696.71	696.74	0.04	199.07	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	696.74	696.82	0.08	417.28	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	696.82	696.90	0.08	410.21	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	696.90	697.02	0.12	613.40	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.02	697.10	0.08	425.16	NE003	427001	6725	Thurman fine sand, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	697.10	697.12	0.03	139.60	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.12	697.29	0.17	881.22	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.29	697.32	0.03	141.75	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.32	697.44	0.12	654.89	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.44	697.52	0.08	419.02	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	697.52	697.65	0.13	664.49	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.65	697.65	0.01	38.94	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.65	697.82	0.17	897.35	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.82	697.87	0.05	251.96	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.87	697.90	0.03	142.86	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	697.90	697.93	0.04	187.46	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	697.93	698.10	0.17	883.49	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.10	698.12	0.02	81.77	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	698.12	698.16	0.04	222.71	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.16	698.36	0.20	1,031.61	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.36	698.45	0.10	521.97	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.45	698.52	0.07	349.64	NE003	426978	6754	Nora silt loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	698.52	698.73	0.21	1,110.72	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.73	698.83	0.10	519.00	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	698.83	698.95	0.12	656.98	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	698.95	699.03	0.08	397.15	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	699.03	699.10	0.07	373.74	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	699.10	699.14	0.04	225.74	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	699.14	699.34	0.20	1,037.20	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	699.34	699.53	0.19	992.25	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	699.53	699.62	0.09	478.57	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	699.62	699.65	0.03	168.67	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	699.65	699.74	0.09	489.57	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	699.74	699.77	0.03	157.77	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	699.77	699.81	0.04	225.88	NE003	426968	6791	Loretto loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	699.81	699.87	0.06	309.42	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	699.87	700.39	0.52	2,749.34	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	700.39	700.42	0.03	137.47	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	700.42	700.54	0.12	619.20	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	700.54	700.66	0.12	641.86	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	700.66	700.87	0.22	1,140.69	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	700.87	700.90	0.03	142.79	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	700.90	700.93	0.03	140.04	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	700.93	700.95	0.02	95.64	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	700.95	700.99	0.04	220.27	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	700.99	701.01	0.02	92.27	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.01	701.13	0.12	648.08	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	701.13	701.20	0.08	399.89	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.20	701.29	0.08	436.54	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.29	701.37	0.08	419.61	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.37	701.41	0.04	213.56	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.41	701.47	0.06	339.23	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.47	701.66	0.19	977.05	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.66	701.66	0.00	3.81	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.66	701.73	0.07	380.18	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	701.73	701.78	0.05	259.94	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.78	701.85	0.07	368.50	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.85	701.90	0.05	289.24	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	701.90	701.91	0.01	43.41	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	701.91	702.01	0.10	533.79	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	702.01	702.04	0.03	134.45	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.04	702.07	0.03	158.26	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.07	702.09	0.03	134.11	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.09	702.15	0.06	305.06	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.15	702.19	0.04	187.77	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.19	702.25	0.06	340.95	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.25	702.29	0.04	209.99	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.29	702.34	0.05	267.40	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.34	702.36	0.02	87.75	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	702.36	702.45	0.09	469.12	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.45	702.47	0.02	130.97	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	702.47	702.55	0.07	393.32	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.55	702.57	0.02	104.30	NE003	426949	3165	Doger loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.57	702.66	0.09	482.16	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.66	702.71	0.06	293.40	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.71	702.75	0.04	193.03	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.75	702.85	0.10	532.77	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.85	702.86	0.01	38.03	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	702.86	702.90	0.04	211.49	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	702.90	703.04	0.14	763.19	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.04	703.10	0.06	319.17	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.10	703.15	0.05	262.97	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	703.15	703.24	0.08	444.38	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.24	703.27	0.03	156.57	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.27	703.32	0.05	283.20	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	703.32	703.45	0.13	668.46	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.45	703.48	0.03	175.84	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	703.48	703.55	0.07	371.93	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.55	703.62	0.07	348.29	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.62	703.63	0.02	89.05	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.63	703.74	0.10	552.44	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	703.74	703.89	0.15	794.35	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	703.89	703.95	0.07	349.65	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	703.95	704.01	0.06	318.36	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.01	704.11	0.09	492.74	NE003	426965	4178	Longford complex, 1 to 7 percent slopes
APRIL ROUTE ALTERNATIVE	704.11	704.16	0.06	294.19	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.16	704.25	0.09	458.99	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.25	704.29	0.04	234.54	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.29	704.32	0.03	142.93	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.32	704.35	0.03	161.40	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.35	704.39	0.04	197.48	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.39	704.46	0.07	378.77	NE003	426947	3163	Doger fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.46	704.50	0.04	227.13	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.50	704.60	0.09	501.02	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.60	704.66	0.06	311.44	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	704.66	704.70	0.04	231.40	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.70	704.76	0.05	284.24	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.76	704.89	0.13	704.62	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	704.89	705.01	0.12	625.49	NE003	426965	4178	Longford complex, 1 to 7 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	705.01	705.05	0.04	209.22	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.05	705.16	0.12	616.88	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.16	705.18	0.02	86.71	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.18	705.18	0.00	13.39	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.18	705.35	0.16	858.71	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.35	705.36	0.02	101.51	NE003	427001	6725	Thurman fine sand, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	705.36	705.40	0.03	173.21	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	705.40	705.52	0.12	631.91	NE003	426940	6688	Crofton silt loam, 6 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	705.52	705.61	0.09	497.77	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	705.61	705.75	0.14	726.83	NE003	426940	6688	Crofton silt loam, 6 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	705.75	705.80	0.05	255.11	NE003	427001	6725	Thurman fine sand, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	705.80	705.85	0.05	268.08	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.85	705.90	0.05	261.56	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	705.90	706.03	0.14	720.56	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	706.03	706.14	0.11	573.14	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	706.14	706.18	0.03	172.52	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	706.18	706.38	0.21	1,083.59	NE003	427007	4786	Valentine fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	706.38	706.60	0.22	1,136.44	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	706.60	706.63	0.04	189.91	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	706.63	706.71	0.08	417.96	NE003	426989	6579	Ortello loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	706.71	706.79	0.08	432.06	NE003	426958	8869	Hord silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	706.79	706.82	0.03	155.38	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	706.82	706.93	0.10	546.19	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	706.93	706.99	0.07	344.25	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	706.99	707.01	0.02	86.30	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.01	707.11	0.11	562.53	NE003	426949	3165	Doger loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.11	707.13	0.02	86.55	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	707.13	707.17	0.04	213.87	NE003	426935	6637	Boelus loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.17	707.25	0.08	397.15	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.25	707.37	0.12	646.02	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	707.37	707.49	0.13	664.61	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	707.49	707.75	0.25	1,345.07	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.75	707.94	0.19	1,024.08	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.94	707.97	0.03	138.14	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	707.97	708.16	0.19	997.91	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	708.16	708.47	0.32	1,663.73	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	708.47	708.63	0.15	805.30	NE003	426967	6799	Loretto sandy loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	708.63	708.70	0.07	383.21	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	708.70	708.78	0.09	456.89	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	708.78	708.81	0.03	155.27	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	708.81	708.96	0.15	767.87	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	708.96	708.99	0.03	146.15	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	708.99	709.03	0.04	201.11	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.03	709.10	0.08	396.92	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.10	709.34	0.24	1,278.60	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.34	709.44	0.10	523.28	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	709.44	709.57	0.13	699.26	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.57	709.63	0.05	288.43	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	709.63	709.66	0.03	146.20	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.66	709.66	0.01	43.65	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	709.66	709.72	0.05	284.39	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.72	709.78	0.06	335.40	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	709.78	709.84	0.06	308.14	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	709.84	709.93	0.09	480.23	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	709.93	710.12	0.19	994.87	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	710.12	710.17	0.05	285.12	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	710.17	710.21	0.04	191.00	NE003	426940	6688	Crofton silt loam, 6 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	710.21	710.37	0.16	852.90	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	710.37	710.43	0.06	320.12	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	710.43	710.49	0.05	279.52	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	710.49	710.57	0.08	436.66	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	710.57	710.70	0.13	676.55	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	710.70	710.70	0.00	18.99	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	710.70	710.97	0.27	1,436.08	NE003	426980	6749	Nora silt loam, 11 to 17 percent slopes
APRIL ROUTE ALTERNATIVE	710.97	711.04	0.07	362.09	NE003	426940	6688	Crofton silt loam, 6 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	711.04	711.42	0.38	1,980.56	NE003	426980	6749	Nora silt loam, 11 to 17 percent slopes
APRIL ROUTE ALTERNATIVE	711.42	711.53	0.12	610.73	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	711.53	711.62	0.09	479.73	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	711.62	711.70	0.08	422.21	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	711.70	711.73	0.03	139.88	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	711.73	711.79	0.07	346.96	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	711.79	711.83	0.04	196.62	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	711.83	711.87	0.03	180.57	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	711.87	711.90	0.04	199.53	NE003	426940	6688	Crofton silt loam, 6 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	711.90	711.95	0.05	242.45	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	711.95	712.04	0.09	476.91	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	712.04	712.96	0.92	4,848.87	NE003	426958	8869	Hord silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	712.96	713.06	0.11	561.84	NE003	426938	8435	Cass loam, rarely flooded
APRIL ROUTE ALTERNATIVE	713.06	713.24	0.18	929.09	NE003	426960	2330	Inavale fine sand, rarely flooded
APRIL ROUTE ALTERNATIVE	713.24	713.32	0.08	422.84	NE003	426952	4384	Nenzel loamy fine sand, very rarely flooded
APRIL ROUTE ALTERNATIVE	713.32	713.33	0.01	67.17	NE003	426961	6459	Inglewood-Boel complex, channeled, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	713.33	713.36	0.03	132.48	NE003	654009	9999	Water
APRIL ROUTE ALTERNATIVE	713.36	713.48	0.12	652.11	NE003	426960	2330	Inavale fine sand, rarely flooded
APRIL ROUTE ALTERNATIVE	713.48	713.51	0.03	166.49	NE003	426961	6459	Inglewood-Boel complex, channeled, occasionally flooded
APRIL ROUTE ALTERNATIVE	713.51	713.58	0.07	345.51	NE003	426958	8869	Hord silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	713.58	713.70	0.12	617.14	NE003	427002	6700	Thurman loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	713.70	713.77	0.08	409.17	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	713.77	713.88	0.11	567.18	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	713.88	713.95	0.07	352.27	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	713.95	714.04	0.09	500.49	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	714.04	714.16	0.12	607.75	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.16	714.23	0.07	385.99	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.23	714.26	0.03	172.34	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.26	714.31	0.05	263.54	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.31	714.44	0.13	667.17	NE003	426999	6723	Thurman fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.44	714.56	0.12	655.03	NE003	426949	3165	Doger loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	714.56	714.66	0.10	518.08	NE003	427000	6724	Thurman fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	714.66	714.70	0.04	197.11	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	714.70	714.88	0.18	963.36	NE003	426948	3164	Doger loamy fine sand, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	714.88	714.92	0.04	209.25	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	714.92	714.96	0.04	204.52	NE003	426934	6636	Boelus loamy fine sand, 0 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	714.96	715.01	0.05	274.03	NE003	426933	6635	Boelus fine sand, 0 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.01	715.09	0.08	397.13	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.09	715.31	0.22	1,157.27	NE003	426969	6792	Loretto loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.31	715.41	0.10	535.81	NE003	427004	6733	Thurman-Crofton complex, 11 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	715.41	715.45	0.04	211.41	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.45	715.59	0.15	772.49	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	715.59	715.73	0.14	713.15	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	715.73	715.85	0.12	624.44	NE003	427003	6703	Thurman loamy fine sand, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.85	715.86	0.02	82.14	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.86	715.91	0.05	274.20	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.91	715.97	0.06	315.36	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	715.97	716.04	0.06	337.55	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	716.04	716.19	0.15	778.67	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	716.19	716.26	0.07	388.09	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	716.26	716.28	0.02	86.44	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	716.28	716.33	0.06	296.46	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	716.33	716.38	0.05	255.29	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	716.38	716.44	0.06	313.57	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	716.44	716.52	0.08	399.98	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	716.52	716.74	0.22	1,172.52	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	716.74	716.87	0.14	725.98	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	716.87	716.88	0.00	23.93	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	716.88	717.02	0.14	738.59	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	717.02	717.08	0.06	315.07	NE003	426946	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	717.08	717.48	0.40	2,104.02	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	717.48	717.55	0.07	365.44	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	717.55	717.69	0.14	747.34	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	717.69	717.81	0.12	629.52	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	717.81	717.89	0.09	459.25	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	717.89	718.10	0.20	1,073.10	NE003	426977	6753	Nora silt loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	718.10	718.40	0.31	1,623.61	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	718.40	718.51	0.10	531.06	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	718.51	718.58	0.08	402.68	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	718.58	718.63	0.05	259.48	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	718.63	718.65	0.02	96.38	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	718.65	718.77	0.12	632.12	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	718.77	718.82	0.05	265.94	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	718.82	718.96	0.14	742.14	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	718.96	719.20	0.24	1,248.03	NE003	426974	6808	Moody silty clay loam, 0 to 2 percent slopes
APRIL ROUTE ALTERNATIVE	719.20	719.32	0.12	634.10	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	719.32	719.45	0.13	679.73	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	719.45	719.45	0.00	9.29	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	719.45	719.51	0.06	313.54	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	719.51	719.58	0.07	372.14	NE003	426943	6698	Crofton-Nora silt loams, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	719.58	719.83	0.25	1,344.89	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	719.83	720.11	0.28	1,494.41	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.11	720.18	0.07	345.48	NE003	426978	6754	Nora silt loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.18	720.26	0.08	398.89	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.26	720.31	0.05	287.49	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.31	720.38	0.07	345.32	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.38	720.41	0.04	202.74	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.41	720.75	0.34	1,800.06	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.75	720.83	0.07	391.48	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.83	720.88	0.05	285.47	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	720.88	720.99	0.11	581.12	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	720.99	721.00	0.01	47.85	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	721.00	721.08	0.08	422.97	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	721.08	721.20	0.11	606.80	NE003	426975	6811	Moody silty clay loam, 2 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	721.20	721.51	0.31	1,662.94	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	721.51	721.83	0.32	1,678.14	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	721.83	721.84	0.02	79.86	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	721.84	721.94	0.09	483.74	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	721.94	721.98	0.04	236.89	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	721.98	722.01	0.03	158.78	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.01	722.09	0.08	416.63	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.09	722.37	0.28	1,455.61	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.37	722.43	0.07	352.11	NE003	426956	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	722.43	722.52	0.08	447.57	NE003	426959	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	722.52	722.77	0.25	1,321.61	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.77	722.81	0.04	214.65	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.81	722.97	0.16	834.61	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	722.97	723.03	0.06	319.84	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	723.03	723.30	0.27	1,415.85	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	723.30	723.37	0.08	411.91	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	723.37	723.42	0.04	233.99	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	723.42	723.63	0.22	1,144.59	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	723.63	724.03	0.39	2,070.01	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.03	724.06	0.03	182.28	NE003	426945	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.06	724.13	0.06	342.00	NE003	426944	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.13	724.13	0.00	17.48	NE003	426979	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.13	724.33	0.20	1,073.82	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.33	724.42	0.09	472.15	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.42	724.44	0.02	118.05	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.44	724.47	0.03	151.04	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.47	724.51	0.04	194.53	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.51	724.51	0.00	5.13	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.51	724.59	0.08	413.71	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.59	724.68	0.09	494.26	NE011	427018	3561	Hobbs silt loam, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	724.68	724.73	0.05	255.87	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	724.73	724.85	0.12	612.94	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	724.85	725.32	0.47	2,489.43	NE011	427040	6556	Shell silt loam, rarely flooded
APRIL ROUTE ALTERNATIVE	725.32	725.34	0.03	138.38	NE011	427019	8869	Hord silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	725.34	725.60	0.25	1,321.61	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	725.60	725.67	0.07	369.63	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	725.67	725.80	0.13	703.86	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	725.80	725.83	0.03	163.55	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	725.83	726.08	0.25	1,321.65	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	726.08	726.11	0.03	176.69	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	726.11	726.36	0.25	1,307.76	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	726.36	726.56	0.20	1,068.00	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	726.56	726.61	0.05	273.35	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	726.61	726.90	0.28	1,501.27	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	726.90	727.19	0.29	1,539.00	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.19	727.52	0.33	1,722.10	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.52	727.56	0.05	243.27	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.56	727.62	0.06	317.30	NE011	427030	6681	Crofton silt loam, 17 to 30 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.62	727.75	0.12	655.71	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.75	727.83	0.08	426.04	NE011	427030	6681	Crofton silt loam, 17 to 30 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.83	727.83	0.00	5.58	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.83	727.92	0.09	465.95	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.92	727.97	0.06	290.60	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	727.97	728.65	0.68	3,589.33	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	728.65	728.80	0.15	782.25	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	728.80	728.85	0.05	247.83	NE011	427028	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	728.85	728.90	0.06	304.85	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	728.90	729.24	0.33	1,763.91	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.24	729.29	0.05	263.02	NE011	427043	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	729.29	729.32	0.03	167.97	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	729.32	729.34	0.02	113.95	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.34	729.37	0.03	172.90	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	729.37	729.39	0.01	69.28	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.39	729.46	0.07	386.56	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.46	729.48	0.02	118.87	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.48	729.54	0.06	306.02	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.54	729.58	0.04	185.05	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.58	729.66	0.08	437.47	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.66	729.69	0.03	183.70	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.69	729.96	0.27	1,419.20	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	729.96	730.03	0.07	350.54	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	730.03	730.13	0.10	517.69	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.13	730.17	0.04	198.17	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	730.17	730.21	0.05	259.06	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	730.21	730.23	0.01	67.49	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.23	730.31	0.08	434.84	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.31	730.42	0.11	595.10	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.42	730.56	0.13	705.78	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	730.56	730.59	0.03	177.82	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.59	730.81	0.22	1,174.92	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.81	730.94	0.13	671.27	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	730.94	731.23	0.29	1,511.93	NE011	427040	6556	Shell silt loam, rarely flooded
APRIL ROUTE ALTERNATIVE	731.23	731.33	0.10	547.94	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	731.33	731.36	0.03	144.47	NE011	427040	6556	Shell silt loam, rarely flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	731.36	731.39	0.03	166.38	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.39	731.46	0.07	371.58	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	731.46	731.54	0.08	443.30	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.54	731.60	0.06	329.53	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.60	731.66	0.06	298.16	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.66	731.68	0.01	74.04	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.68	731.70	0.03	141.31	NE011	427028	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	731.70	731.93	0.23	1,229.87	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	731.93	731.96	0.02	127.59	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	731.96	732.26	0.30	1,590.89	NE011	427059	6755	Nora silt loam, 6 to 11 percent slopes
APRIL ROUTE ALTERNATIVE	732.26	732.43	0.17	913.59	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.43	732.51	0.07	382.75	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.51	732.52	0.02	89.89	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.52	732.61	0.09	451.39	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.61	732.66	0.05	274.27	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.66	732.76	0.10	531.61	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.76	732.83	0.06	338.25	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.83	732.97	0.14	763.46	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	732.97	733.04	0.07	371.87	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	733.04	733.11	0.07	348.42	NE011	427030	6681	Crofton silt loam, 17 to 30 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	733.11	733.28	0.17	901.16	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	733.28	733.34	0.07	344.28	NE011	427058	6780	Nora-Moody complex, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	733.34	733.53	0.19	1,011.35	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	733.53	734.18	0.65	3,431.56	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	734.18	734.24	0.05	282.77	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	734.24	734.26	0.03	132.87	NE011	427028	6697	Crofton-Nora silt loams, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	734.26	734.33	0.06	335.45	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	734.33	734.46	0.13	699.74	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	734.46	734.66	0.20	1,055.32	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	734.66	734.76	0.10	551.37	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	734.76	734.80	0.04	208.95	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	734.80	735.45	0.64	3,402.96	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	735.45	735.50	0.05	265.23	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	735.50	735.68	0.19	985.04	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	735.68	735.78	0.09	500.01	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	735.78	736.47	0.69	3,649.88	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	736.47	736.69	0.22	1,177.70	NE011	427058	6780	Nora-Moody complex, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	736.69	736.87	0.18	930.36	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	736.87	736.99	0.12	621.30	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	736.99	737.09	0.10	537.62	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	737.09	737.14	0.05	289.65	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	737.14	737.57	0.43	2,261.70	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	737.57	737.81	0.24	1,271.12	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	737.81	737.85	0.03	174.23	NE011	427055	6810	Moody silty clay loam, 1 to 3 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	737.85	737.96	0.11	585.11	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	737.96	738.09	0.14	730.09	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	738.09	738.16	0.07	369.17	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	738.16	738.24	0.07	393.76	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	738.24	738.53	0.29	1,549.94	NE011	427043	8872	Hord silt loam, 3 to 6 percent slopes
APRIL ROUTE ALTERNATIVE	738.53	738.59	0.05	281.44	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	738.59	738.87	0.29	1,528.19	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	738.87	739.79	0.92	4,834.30	NE011	427040	6556	Shell silt loam, rarely flooded
APRIL ROUTE ALTERNATIVE	739.79	739.98	0.19	1,008.35	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	739.98	739.99	0.01	44.00	NE011	427040	6556	Shell silt loam, rarely flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	739.99	740.05	0.06	310.22	NE011	427018	3561	Hobbs silt loam, occasionally flooded
RV-1038	740.05	740.07	0.03	134.73	NE011	427018	3561	Hobbs silt loam, occasionally flooded
RV-1038	740.07	740.48	0.40	2,137.21	NE011	427040	6556	Shell silt loam, rarely flooded
RV-1038	740.48	740.67	0.19	1,017.59	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1038	740.67	740.71	0.04	222.26	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
RV-1038	740.71	740.75	0.04	190.97	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1038	740.75	740.80	0.05	242.38	NE011	427018	3561	Hobbs silt loam, occasionally flooded
RV-1038	740.80	740.89	0.09	476.35	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1038	740.89	740.92	0.04	203.79	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
RV-1038	740.92	740.95	0.03	150.44	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1038	740.95	741.01	0.06	321.19	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
RV-1038	741.01	741.02	0.01	46.42	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.02	741.04	0.02	106.57	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.04	741.08	0.03	180.57	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.08	741.13	0.05	272.38	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.13	741.16	0.03	180.00	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.16	741.34	0.18	935.56	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.34	741.48	0.14	739.80	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.48	741.49	0.01	49.94	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.49	741.51	0.02	121.07	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	741.51	742.02	0.51	2,683.67	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	742.02	742.11	0.09	496.26	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.11	742.13	0.01	68.08	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.13	742.22	0.10	506.38	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.22	742.33	0.11	570.94	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	742.33	742.38	0.05	266.07	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.38	742.47	0.09	486.57	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.47	742.71	0.24	1,255.06	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.71	742.74	0.03	137.66	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.74	742.88	0.14	734.29	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	742.88	743.05	0.18	934.35	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	743.05	743.11	0.06	299.29	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	743.11	743.17	0.06	333.78	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	743.17	743.34	0.17	878.11	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	743.34	743.34	0.00	22.59	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	743.34	743.41	0.07	368.69	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	743.41	743.58	0.16	864.94	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	743.58	743.74	0.17	881.14	NE011	427040	6556	Shell silt loam, rarely flooded
APRIL ROUTE ALTERNATIVE	743.74	743.76	0.02	103.17	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	743.76	743.78	0.01	61.98	NE011	679593	9999	Water
APRIL ROUTE ALTERNATIVE	743.78	743.82	0.04	209.60	NE011	427031	8440	Cass soils, rarely flooded
APRIL ROUTE ALTERNATIVE	743.82	744.03	0.22	1,153.34	NE011	427019	8869	Hord silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	744.03	744.13	0.09	491.95	NE011	427048	6352	Leshara silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	744.13	744.47	0.34	1,807.42	NE011	427047	3518	Lamo silty clay loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	744.47	744.66	0.19	984.93	NE011	427039	8841	Hall silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	744.66	744.72	0.06	319.71	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	744.72	744.83	0.11	599.41	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	744.83	744.93	0.10	549.40	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	744.93	744.98	0.05	264.10	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	744.98	745.07	0.08	425.05	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	745.07	745.15	0.08	447.53	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	745.15	745.28	0.13	673.31	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	745.28	745.31	0.03	161.24	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	745.31	745.40	0.09	495.78	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	745.40	745.45	0.04	229.61	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
RV-1039	745.45	745.70	0.25	1,340.43	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
RV-1039	745.70	745.82	0.12	616.50	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
RV-1039	745.82	745.91	0.09	478.69	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
RV-1039	745.91	746.11	0.21	1,090.44	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
RV-1039	746.11	746.17	0.05	283.24	NE011	427018	3561	Hobbs silt loam, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
RV-1039	746.17	746.40	0.23	1,216.75	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
RV-1039	746.40	746.40	0.00	11.91	NE011	427034	3951	Fillmore silt loam, occasionally ponded
RV-1039	746.40	746.82	0.42	2,214.54	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
RV-1039	746.82	746.87	0.05	278.91	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
RV-1039	746.87	746.89	0.02	86.86	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	746.89	746.92	0.04	190.17	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	746.92	747.02	0.09	481.83	NE011	427034	3951	Fillmore silt loam, occasionally ponded
APRIL ROUTE ALTERNATIVE	747.02	747.06	0.05	239.33	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	747.06	747.12	0.06	298.44	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	747.12	747.34	0.22	1,174.43	NE011	427037	8851	Hall-Gayville complex, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	747.34	747.62	0.28	1,456.28	NE011	427038	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	747.62	747.84	0.22	1,162.27	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	747.84	747.90	0.06	320.34	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	747.90	748.48	0.58	3,074.84	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	748.48	748.55	0.07	375.81	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	748.55	748.60	0.05	277.75	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	748.60	748.75	0.15	793.06	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	748.75	748.84	0.09	460.81	NE011	427018	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	748.84	749.07	0.23	1,196.62	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.07	749.15	0.09	454.32	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	749.15	749.18	0.03	141.93	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.18	749.23	0.05	268.26	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	749.23	749.28	0.05	268.77	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.28	749.36	0.08	440.27	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.36	749.45	0.08	445.06	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.45	749.61	0.16	869.89	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	749.61	749.61	0.00	1.25	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.61	749.65	0.03	175.75	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.65	749.74	0.10	505.29	NE011	427028	6697	Crofton-Nora silt loams, 17 to 30 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	749.74	749.80	0.06	311.89	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	749.80	749.97	0.17	905.92	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	749.97	749.98	0.00	11.21	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
RV-1040	749.98	750.09	0.12	608.89	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
RV-1040	750.09	750.27	0.18	963.84	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
RV-1040	750.27	750.36	0.09	473.14	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1040	750.36	750.36	0.00	10.08	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
RV-1040	750.36	750.46	0.09	501.53	NE011	427018	3561	Hobbs silt loam, occasionally flooded
RV-1040	750.46	750.58	0.12	653.27	NE011	427020	8870	Hord silt loam, 1 to 3 percent slopes
RV-1040	750.58	750.65	0.07	353.51	NE011	427018	3561	Hobbs silt loam, occasionally flooded
RV-1040	750.65	750.69	0.04	201.33	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1040	750.69	750.77	0.08	429.60	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
RV-1040	750.77	750.86	0.09	459.13	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
RV-1040	750.86	750.94	0.08	419.74	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	750.94	750.96	0.02	127.65	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	750.96	751.23	0.27	1,426.08	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.23	751.31	0.08	420.28	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.31	751.61	0.30	1,562.96	NE011	427060	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.61	751.76	0.15	802.17	NE011	427027	6696	Crofton-Nora silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.76	751.78	0.02	90.25	NE011	427026	6699	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.78	751.82	0.04	226.86	NE011	427056	6812	Moody silty clay loam, 2 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	751.82	752.42	0.60	3,151.60	NE011	427054	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	752.42	752.82	0.40	2,112.11	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	752.82	753.08	0.26	1,384.08	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	753.08	753.11	0.03	175.80	NE125	427491	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	753.11	753.44	0.33	1,735.75	NE125	427504	6757	Nora silt loam, 6 to 11 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	753.44	753.47	0.03	175.86	NE125	427489	6821	Moody-Nora silt loams, 3 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	753.47	753.50	0.03	157.81	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	753.50	753.54	0.04	213.36	NE125	427467	3952	Fillmore silt loam, frequently ponded
APRIL ROUTE ALTERNATIVE	753.54	753.76	0.22	1,135.24	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	753.76	754.18	0.42	2,220.09	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	754.18	754.22	0.04	231.48	NE125	427497	6777	Nora-Crofton silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	754.22	754.33	0.11	589.96	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	754.33	754.97	0.64	3,361.62	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	754.97	755.00	0.03	154.57	NE125	427497	6777	Nora-Crofton silt loams, 11 to 17 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	755.00	755.69	0.69	3,626.93	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	755.69	755.85	0.16	848.98	NE125	427467	3952	Fillmore silt loam, frequently ponded
APRIL ROUTE ALTERNATIVE	755.85	756.01	0.17	873.01	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	756.01	756.05	0.03	171.29	NE125	427467	3952	Fillmore silt loam, frequently ponded
APRIL ROUTE ALTERNATIVE	756.05	756.48	0.44	2,314.22	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	756.48	756.53	0.05	245.32	NE125	427467	3952	Fillmore silt loam, frequently ponded
APRIL ROUTE ALTERNATIVE	756.53	758.26	1.73	9,137.17	NE125	2228987	6809	Moody silty clay loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	758.26	758.29	0.03	149.39	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	758.29	758.34	0.05	259.17	NE125	427464	6680	Crofton silt loam, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	758.34	758.36	0.02	122.47	NE125	427504	6757	Nora silt loam, 6 to 11 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	758.36	758.40	0.04	207.48	NE125	427465	6683	Crofton silt loam, 17 to 30 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	758.40	758.43	0.03	174.62	NE125	427464	6680	Crofton silt loam, 17 to 30 percent slopes
APRIL ROUTE ALTERNATIVE	758.43	758.49	0.05	284.15	NE125	427465	6683	Crofton silt loam, 17 to 30 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	758.49	758.63	0.14	763.53	NE125	427457	6624	Belfore silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	758.63	758.77	0.14	721.98	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	758.77	758.82	0.05	258.47	NE125	427465	6683	Crofton silt loam, 17 to 30 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	758.82	759.16	0.35	1,822.56	NE125	427504	6757	Nora silt loam, 6 to 11 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	759.16	759.19	0.02	128.29	NE125	427470	8841	Hall silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	759.19	759.43	0.25	1,299.98	NE125	427479	3776	Muir silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	759.43	759.53	0.10	531.24	NE125	427470	8841	Hall silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	759.53	759.65	0.12	625.78	NE125	427520	3553	Hobbs silt loam, frequently flooded
APRIL ROUTE ALTERNATIVE	759.65	759.72	0.07	365.08	NE125	427469	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	759.72	759.83	0.11	596.53	NE125	427504	6757	Nora silt loam, 6 to 11 percent slopes, severely eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	759.83	759.87	0.04	194.47	NE125	427463	6678	Crofton silt loam, 11 to 17 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	759.87	760.06	0.18	970.01	NE125	427504	6757	Nora silt loam, 6 to 11 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	760.06	760.18	0.12	632.28	NE125	427465	6683	Crofton silt loam, 17 to 30 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	760.18	760.79	0.62	3,258.87	NE125	427503	6756	Nora silt loam, 6 to 11 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	760.79	760.83	0.04	215.79	NE125	427505	4105	Geary variant silty clay loam, 7 to 11 percent slopes, severely eroded
APRIL ROUTE ALTERNATIVE	760.83	760.93	0.10	513.55	NE125	427472	8844	Hall silt loam, 3 to 6 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	760.93	760.94	0.01	55.05	NE125	427479	3776	Muir silt loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	760.94	761.08	0.14	744.52	NE125	427469	8840	Hall silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	761.08	761.14	0.06	293.86	NE125	427491	3561	Hobbs silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.14	761.23	0.09	481.73	NE125	427459	8439	Cass silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.23	761.30	0.07	352.06	NE125	427535	8590	Wann silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.30	761.39	0.10	517.85	NE125	427466	3521	Cass fine sandy loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.39	761.46	0.06	327.79	NE125	427516	2332	Inavale fine sand, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.46	761.58	0.13	667.56	NE125	427515	8493	Gothenburg loamy sand, frequently flooded
APRIL ROUTE ALTERNATIVE	761.58	761.78	0.20	1,053.35	NE125	449797	9999	Water
APRIL ROUTE ALTERNATIVE	761.78	761.82	0.04	216.65	NE125	427515	8493	Gothenburg loamy sand, frequently flooded
APRIL ROUTE ALTERNATIVE	761.82	761.86	0.04	212.62	NE125	427530	4789	Valentine fine sand, 3 to 17 percent slopes
APRIL ROUTE ALTERNATIVE	761.86	761.89	0.03	152.74	NE125	427515	8493	Gothenburg loamy sand, frequently flooded
APRIL ROUTE ALTERNATIVE	761.89	761.99	0.09	497.20	NE125	427466	3521	Cass fine sandy loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	761.99	762.01	0.03	151.78	NE125	427519	2115	Inavale soils, frequently flooded
APRIL ROUTE ALTERNATIVE	762.01	762.17	0.16	832.11	NE125	427466	3521	Cass fine sandy loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	762.17	762.23	0.06	306.46	NE125	427519	2115	Inavale soils, frequently flooded
APRIL ROUTE ALTERNATIVE	762.23	762.28	0.05	285.00	NE125	427466	3521	Cass fine sandy loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	762.28	762.34	0.05	280.15	NE125	427525	6701	Thurman loamy fine sand, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	762.34	762.42	0.08	414.64	NE125	427530	4789	Valentine fine sand, 3 to 17 percent slopes
APRIL ROUTE ALTERNATIVE	762.42	762.49	0.07	394.33	NE125	427526	6702	Thurman loamy fine sand, 1 to 3 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	762.49	762.58	0.09	485.21	NE125	427508	6843	Ortello fine sandy loam, 1 to 3 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
APRIL ROUTE ALTERNATIVE	762.58	762.74	0.16	821.75	NE125	427512	6583	Ortello very fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	762.74	762.76	0.02	89.55	NE125	427509	6844	Ortello fine sandy loam, 1 to 3 percent slopes, eroded
APRIL ROUTE ALTERNATIVE	762.76	762.78	0.03	137.95	NE125	427508	6843	Ortello fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	762.78	762.84	0.06	297.01	NE125	427535	8590	Wann silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	762.84	762.95	0.11	587.26	NE125	427474	8867	Hord fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	762.95	763.44	0.49	2,609.45	NE125	427468	8850	Hall-Gayville variant silt loams, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	763.44	763.50	0.06	317.92	NE125	427535	8590	Wann silt loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	763.50	763.80	0.30	1,583.90	NE125	427514	3726	Detroit silt loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	763.80	763.99	0.19	995.02	NE125	427476	8878	Hord very fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	763.99	764.04	0.05	238.39	NE125	427468	8850	Hall-Gayville variant silt loams, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	764.04	764.06	0.03	141.77	NE125	427481	3518	Lamo silty clay loam, occasionally flooded
APRIL ROUTE ALTERNATIVE	764.06	764.14	0.08	405.53	NE125	427476	8878	Hord very fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	764.14	764.25	0.11	576.37	NE125	427508	6843	Ortello fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	764.25	764.51	0.26	1,391.04	NE125	427476	8878	Hord very fine sandy loam, 0 to 1 percent slopes
APRIL ROUTE ALTERNATIVE	764.51	764.79	0.28	1,475.76	NE125	427508	6843	Ortello fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	764.79	764.86	0.07	369.65	NE125	427512	6583	Ortello very fine sandy loam, 1 to 3 percent slopes
APRIL ROUTE ALTERNATIVE	764.86	764.98	0.12	607.97	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded
Clarks Alternative	764.98	765.19	0.21	1,116.17	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded
Clarks Alternative	765.19	765.26	0.08	396.41	NE125	427477	8879	Hord very fine sandy loam, 1 to 3 percent slopes
Clarks Alternative	765.26	765.38	0.11	587.09	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded
Clarks Alternative	765.38	765.55	0.17	915.83	NE125	427482	8470	Gibbon silt loam, occasionally flooded
Clarks Alternative	765.55	765.58	0.03	182.85	NE125	427509	6844	Ortello fine sandy loam, 1 to 3 percent slopes, eroded
Clarks Alternative	765.58	765.68	0.10	530.57	NE125	427482	8470	Gibbon silt loam, occasionally flooded
Clarks Alternative	765.68	765.71	0.03	156.97	NE125	427485	4267	Loup silt loam, occasionally flooded
Clarks Alternative	765.71	765.78	0.07	374.93	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded
Clarks Alternative	765.78	765.87	0.08	425.34	NE125	427481	3518	Lamo silty clay loam, occasionally flooded
Clarks Alternative	765.87	765.93	0.07	358.11	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	765.93	765.97	0.04	194.60	NE125	427481	3518	Lamo silty clay loam, occasionally flooded
Clarks Alternative	765.97	765.99	0.02	107.79	NE125	427447	3525	Lamo silt loam, moderately saline, occasionally flooded
Clarks Alternative	765.99	766.22	0.23	1,205.46	NE125	427481	3518	Lamo silty clay loam, occasionally flooded
Clarks Alternative	766.22	766.43	0.21	1,113.41	NE125	427459	8439	Cass silt loam, occasionally flooded
Clarks Alternative	766.43	766.48	0.05	246.28	NE125	427485	4267	Loup silt loam, occasionally flooded
Clarks Alternative	766.48	766.49	0.02	93.42	NE125	427466	3521	Cass fine sandy loam, occasionally flooded
Clarks Alternative	766.49	766.62	0.12	640.58	NE125	2228975	2288	Wann loam, occasionally flooded
Clarks Alternative	766.62	766.63	0.02	99.36	NE125	427485	4267	Loup silt loam, occasionally flooded
Clarks Alternative	766.63	766.66	0.03	142.65	NE125	449797	9999	Water
Clarks Alternative	766.66	766.67	0.01	44.90	NE125	427485	4267	Loup silt loam, occasionally flooded
Clarks Alternative	766.67	766.69	0.02	109.65	NE125	427535	8590	Wann silt loam, occasionally flooded
Clarks Alternative	766.69	766.81	0.12	610.60	NE125	2228997	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	766.81	767.02	0.22	1,155.38	NE125	427535	8590	Wann silt loam, occasionally flooded
Clarks Alternative	767.02	767.09	0.06	332.58	NE125	2228997	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	767.09	767.18	0.09	471.97	NE125	2228969	6352	Leshara silt loam, occasionally flooded
Clarks Alternative	767.18	767.23	0.05	261.22	NE121	1709659	6352	Leshara silt loam, occasionally flooded
Clarks Alternative	767.23	767.57	0.34	1,811.97	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	767.57	767.77	0.20	1,040.05	NE121	1709637	8463	Gayville-Caruso complex, occasionally flooded
Clarks Alternative	767.77	767.78	0.01	55.81	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	767.78	767.91	0.14	725.08	NE121	1709659	6352	Leshara silt loam, occasionally flooded
Clarks Alternative	767.91	767.99	0.07	390.09	NE121	1709692	2288	Wann loam, occasionally flooded
Clarks Alternative	767.99	768.17	0.19	984.45	NE121	1709659	6352	Leshara silt loam, occasionally flooded
Clarks Alternative	768.17	768.47	0.30	1,566.62	NE121	1709652	6529	Janude sandy loam, very rarely flooded
Clarks Alternative	768.47	768.50	0.03	163.08	NE121	1709673	3268	O'Neill sandy loam, 2 to 6 percent slopes
Clarks Alternative	768.50	768.59	0.09	474.75	NE121	1709625	6517	Blendon variant fine sandy loam, 0 to 2 percent slopes
Clarks Alternative	768.59	768.66	0.07	347.01	NE121	1709647	8874	Hord silt loam, sandy substratum, 0 to 1 percent slopes
Clarks Alternative	768.66	769.39	0.73	3,853.80	NE121	1709625	6517	Blendon variant fine sandy loam, 0 to 2 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	769.39	769.55	0.16	849.93	NE121	1709627	3156	Brocksburg loam, 0 to 2 percent slopes
Clarks Alternative	769.55	769.94	0.39	2,067.97	NE121	1709672	3267	O'Neill sandy loam, 0 to 2 percent slopes
Clarks Alternative	769.94	770.00	0.06	291.83	NE121	1709673	3268	O'Neill sandy loam, 2 to 6 percent slopes
Clarks Alternative	770.00	770.01	0.02	96.87	NE121	1709652	6529	Janude sandy loam, very rarely flooded
Clarks Alternative	770.01	770.04	0.03	136.89	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	770.04	770.07	0.03	177.69	NE121	1709655	6366	Obert silt loam, occasionally flooded
Clarks Alternative	770.07	770.10	0.03	150.81	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	770.10	770.22	0.12	642.81	NE121	1709637	8463	Gayville-Caruso complex, occasionally flooded
Clarks Alternative	770.22	770.28	0.06	298.15	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	770.28	770.36	0.08	405.50	NE121	1709671	8531	Novina sandy loam, rarely flooded
Clarks Alternative	770.36	770.45	0.10	505.80	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	770.45	770.47	0.02	103.16	NE121	1709659	6352	Leshara silt loam, occasionally flooded
Clarks Alternative	770.47	770.71	0.24	1,250.00	NE121	1709671	8531	Novina sandy loam, rarely flooded
Clarks Alternative	770.71	770.83	0.12	655.30	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	770.83	770.85	0.01	75.04	NE121	1709671	8531	Novina sandy loam, rarely flooded
Clarks Alternative	770.85	770.98	0.13	711.02	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	770.98	771.09	0.11	569.61	NE121	1709637	8463	Gayville-Caruso complex, occasionally flooded
Clarks Alternative	771.09	771.28	0.19	1,021.03	NE121	1709660	8503	Lex loam, occasionally flooded
Clarks Alternative	771.28	771.41	0.13	682.84	NE121	1709634	8456	Fonner sandy loam, rarely flooded
Clarks Alternative	771.41	771.48	0.06	329.38	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	771.48	771.58	0.10	539.28	NE121	1709621	8403	Alda loam, occasionally flooded
Clarks Alternative	771.58	772.21	0.64	3,353.79	NE121	1709634	8456	Fonner sandy loam, rarely flooded
Clarks Alternative	772.21	772.46	0.25	1,309.86	NE121	1709637	8463	Gayville-Caruso complex, occasionally flooded
Clarks Alternative	772.46	772.63	0.16	870.86	NE121	1709622	6312	Barney loam, frequently flooded
Clarks Alternative	772.63	772.67	0.04	227.89	NE121	1709649	2335	Inavale loamy fine sand, 0 to 3 percent slopes
Clarks Alternative	772.67	772.74	0.07	368.21	NE121	1709660	8503	Lex loam, occasionally flooded
Clarks Alternative	772.74	772.98	0.25	1,296.89	NE121	1709620	8405	Alda sandy loam, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	772.98	773.17	0.19	997.18	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	773.17	773.32	0.14	760.15	NE121	1709621	8403	Alda loam, occasionally flooded
Clarks Alternative	773.32	773.58	0.26	1,380.92	NE121	1709660	8503	Lex loam, occasionally flooded
Clarks Alternative	773.58	773.69	0.11	585.81	NE121	1709657	3524	Lamo-Saltine complex, occasionally flooded
Clarks Alternative	773.69	773.76	0.07	383.37	NE121	1709662	8508	Lex variant loam, occasionally flooded
Clarks Alternative	773.76	773.85	0.09	476.95	NE121	1709692	2288	Wann loam, occasionally flooded
Clarks Alternative	773.85	773.92	0.06	330.98	NE121	1709676	8563	Platte loam, occasionally flooded
Clarks Alternative	773.92	774.05	0.13	700.38	NE121	1709692	2288	Wann loam, occasionally flooded
Clarks Alternative	774.05	774.09	0.04	216.13	NE121	1709671	8531	Novina sandy loam, rarely flooded
Clarks Alternative	774.09	774.17	0.08	441.05	NE121	1709692	2288	Wann loam, occasionally flooded
Clarks Alternative	774.17	774.22	0.05	267.82	NE121	1709671	8531	Novina sandy loam, rarely flooded
Clarks Alternative	774.22	774.31	0.08	444.77	NE121	1709660	8503	Lex loam, occasionally flooded
Clarks Alternative	774.31	774.41	0.11	559.84	NE121	1709621	8403	Alda loam, occasionally flooded
Clarks Alternative	774.41	774.47	0.05	279.51	NE121	1709660	8503	Lex loam, occasionally flooded
Clarks Alternative	774.47	774.57	0.10	532.89	NE121	1709652	6529	Janude sandy loam, very rarely flooded
Clarks Alternative	774.57	775.02	0.45	2,376.80	NE121	2228289	8490	Gothenburg fine sandy loam, frequently flooded
Clarks Alternative	775.02	775.06	0.04	227.67	NE121	1709690	9999	Water
Clarks Alternative	775.06	775.08	0.02	92.88	NE121	1709641	8495	Gothenburg soils, frequently flooded
Clarks Alternative	775.08	775.12	0.04	234.31	NE143	2218990	8495	Gothenburg soils, frequently flooded
Clarks Alternative	775.12	775.23	0.10	544.00	NE143	1692318	9999	Water
Clarks Alternative	775.23	775.26	0.03	181.76	NE143	1692314	8490	Gothenburg fine sandy loam, frequently flooded
Clarks Alternative	775.26	775.27	0.01	57.17	NE143	1692318	9999	Water
Clarks Alternative	775.27	775.31	0.04	198.83	NE143	1692314	8490	Gothenburg fine sandy loam, frequently flooded
Clarks Alternative	775.31	775.37	0.07	344.24	NE143	1692318	9999	Water
Clarks Alternative	775.37	775.62	0.24	1,284.08	NE143	1692314	8490	Gothenburg fine sandy loam, frequently flooded
Clarks Alternative	775.62	775.64	0.02	118.09	NE143	1692301	2342	Inavale loamy sand, 3 to 6 percent slopes, rarely flooded
Clarks Alternative	775.64	775.66	0.02	121.81	NE143	1692311	8562	Platte fine sandy loam, occasionally flooded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	775.66	775.89	0.23	1,207.02	NE143	1692280	3710	Cass fine sandy loam, rarely flooded
Clarks Alternative	775.89	776.06	0.17	906.52	NE143	1692290	8840	Hall silt loam, 0 to 1 percent slopes
Clarks Alternative	776.06	777.27	1.21	6,370.50	NE143	1692293	3773	Muir silt loam, 0 to 1 percent slopes
Clarks Alternative	777.27	777.33	0.06	301.83	NE143	1692284	2817	Uly silt loam, 3 to 6 percent slopes
Clarks Alternative	777.33	777.48	0.15	788.08	NE143	1692291	3776	Muir silt loam, 1 to 3 percent slopes
Clarks Alternative	777.48	777.76	0.28	1,477.41	NE143	1692283	2517	Coly soils, 6 to 11 percent slopes, severely eroded
Clarks Alternative	777.76	777.87	0.11	589.97	NE143	1692285	2821	Uly silt loam, 6 to 11 percent slopes, eroded
Clarks Alternative	777.87	777.99	0.13	661.35	NE143	1692281	2533	Coly silt loam, 11 to 30 percent slopes
Clarks Alternative	777.99	778.11	0.12	613.76	NE143	1692285	2821	Uly silt loam, 6 to 11 percent slopes, eroded
Clarks Alternative	778.11	778.17	0.06	303.56	NE143	1692281	2533	Coly silt loam, 11 to 30 percent slopes
Clarks Alternative	778.17	778.24	0.07	370.85	NE143	1692285	2821	Uly silt loam, 6 to 11 percent slopes, eroded
Clarks Alternative	778.24	778.35	0.11	583.83	NE143	1692281	2533	Coly silt loam, 11 to 30 percent slopes
Clarks Alternative	778.35	778.46	0.12	608.64	NE143	1692285	2821	Uly silt loam, 6 to 11 percent slopes, eroded
Clarks Alternative	778.46	780.00	1.54	8,110.66	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	780.00	780.04	0.04	211.62	NE143	1692283	2517	Coly soils, 6 to 11 percent slopes, severely eroded
Clarks Alternative	780.04	782.56	2.52	13,329.06	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	782.56	782.63	0.06	332.99	NE143	1692279	3820	Butler silt loam, 0 to 1 percent slopes
Clarks Alternative	782.63	783.38	0.75	3,969.87	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	783.38	783.68	0.30	1,599.79	NE143	1692288	3951	Fillmore silt loam, occasionally ponded
Clarks Alternative	783.68	784.13	0.44	2,347.50	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	784.13	784.28	0.16	825.42	NE143	1692283	2517	Coly soils, 6 to 11 percent slopes, severely eroded
Clarks Alternative	784.28	784.33	0.05	278.78	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	784.33	784.37	0.03	179.69	NE143	1692283	2517	Coly soils, 6 to 11 percent slopes, severely eroded
Clarks Alternative	784.37	784.58	0.21	1,121.83	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	784.58	784.69	0.11	556.91	NE143	1692282	2516	Coly soils, 3 to 6 percent slopes, severely eroded
Clarks Alternative	784.69	784.72	0.03	162.63	NE143	1692271	3561	Hobbs silt loam, occasionally flooded
Clarks Alternative	784.72	784.76	0.05	238.94	NE143	1692282	2516	Coly soils, 3 to 6 percent slopes, severely eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	784.76	785.42	0.66	3,459.82	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	785.42	785.56	0.14	750.15	NE143	1692284	2817	Uly silt loam, 3 to 6 percent slopes
Clarks Alternative	785.56	785.64	0.08	402.74	NE143	1692271	3561	Hobbs silt loam, occasionally flooded
Clarks Alternative	785.64	785.87	0.24	1,245.76	NE143	1692284	2817	Uly silt loam, 3 to 6 percent slopes
Clarks Alternative	785.87	785.97	0.10	514.83	NE143	1692299	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	785.97	786.11	0.14	724.40	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	786.11	786.24	0.13	689.95	NE143	1692299	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	786.24	786.89	0.65	3,453.53	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	786.89	786.95	0.06	305.25	NE143	1692288	3951	Fillmore silt loam, occasionally ponded
Clarks Alternative	786.95	788.19	1.24	6,547.53	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	788.19	788.34	0.15	803.44	NE143	1692297	3968	Hastings soils, 7 to 11 percent slopes, severely eroded
Clarks Alternative	788.34	788.46	0.12	610.30	NE143	1692298	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	788.46	788.73	0.28	1,454.51	NE143	1692296	3966	Hastings soils, 3 to 7 percent slopes, severely eroded
Clarks Alternative	788.73	788.81	0.07	383.04	NE143	1692299	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	788.81	788.87	0.07	368.19	NE143	1692293	3773	Muir silt loam, 0 to 1 percent slopes
Clarks Alternative	788.87	788.92	0.04	221.29	NE143	2218984	3545	Hobbs silt loam, channeled, frequently flooded
Clarks Alternative	788.92	788.93	0.02	81.82	NE143	2219002	8869	Hord silt loam, 0 to 1 percent slopes
Clarks Alternative	788.93	788.97	0.04	208.92	NE185	1692342	8869	Hord silt loam, 0 to 1 percent slopes
Clarks Alternative	788.97	789.06	0.08	441.09	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	789.06	789.16	0.11	570.28	NE185	1692342	8869	Hord silt loam, 0 to 1 percent slopes
Clarks Alternative	789.16	789.17	0.01	35.51	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	789.17	789.23	0.06	314.31	NE185	1692343	8870	Hord silt loam, 1 to 3 percent slopes
Clarks Alternative	789.23	789.37	0.14	739.98	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Clarks Alternative	789.37	789.47	0.10	513.13	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	789.47	789.52	0.05	272.50	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Clarks Alternative	789.52	789.85	0.33	1,752.75	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	789.85	790.31	0.46	2,433.56	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	790.31	790.39	0.08	405.32	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	790.39	790.56	0.18	924.54	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	790.56	790.64	0.07	381.85	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Clarks Alternative	790.64	790.81	0.18	943.76	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	790.81	790.89	0.07	386.46	NE185	1692322	3820	Butler silt loam, 0 to 1 percent slopes
Clarks Alternative	790.89	791.25	0.36	1,908.11	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	791.25	791.34	0.09	501.04	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	791.34	791.44	0.10	502.82	NE185	1692325	3951	Fillmore silt loam, occasionally ponded
Clarks Alternative	791.44	791.50	0.06	327.54	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	791.50	791.64	0.14	713.63	NE185	1692334	3868	Hastings silt loam, 3 to 7 percent slopes
Clarks Alternative	791.64	791.72	0.08	436.31	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	791.72	791.93	0.21	1,115.72	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	791.93	792.01	0.08	403.94	NE185	1692322	3820	Butler silt loam, 0 to 1 percent slopes
Clarks Alternative	792.01	792.25	0.25	1,303.14	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	792.25	792.66	0.41	2,138.69	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	792.66	793.16	0.50	2,653.89	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	793.16	793.26	0.10	521.32	NE185	1692322	3820	Butler silt loam, 0 to 1 percent slopes
Clarks Alternative	793.26	793.40	0.14	750.29	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	793.40	793.69	0.29	1,521.82	NE185	1692333	3866	Hastings silt loam, 1 to 3 percent slopes
Clarks Alternative	793.69	794.28	0.59	3,103.78	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	794.28	794.33	0.06	294.21	NE185	1692322	3820	Butler silt loam, 0 to 1 percent slopes
Clarks Alternative	794.33	794.58	0.24	1,279.23	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	794.58	794.67	0.09	489.26	NE185	1692325	3951	Fillmore silt loam, occasionally ponded
Clarks Alternative	794.67	794.72	0.05	277.54	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	794.72	794.83	0.11	557.20	NE185	1692325	3951	Fillmore silt loam, occasionally ponded
Clarks Alternative	794.83	795.04	0.22	1,136.61	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	795.04	795.11	0.07	368.19	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Clarks Alternative	795.11	796.00	0.89	4,681.72	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
Clarks Alternative	796.00	796.02	0.02	90.00	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Clarks Alternative	796.02	796.06	0.05	245.51	NE185	1692337	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Clarks Alternative	796.06	796.07	0.01	62.87	NE185	1692336	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Clarks Alternative	796.07	796.32	0.25	1,319.98	NE185	1692332	3864	Hastings silt loam, 0 to 1 percent slopes
FEIS	796.32	840.95	No Change in FEIS					
Western Alternative	840.95	841.03	0.08	414.06	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	841.03	841.06	0.03	145.16	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	841.06	841.10	0.04	205.21	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	841.10	841.41	0.31	1,661.62	NE151	1691143	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	841.41	841.48	0.07	351.42	NE151	1691141	3820	Butler silt loam, 0 to 1 percent slopes
Western Alternative	841.48	841.61	0.13	683.45	NE151	1691143	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	841.61	841.66	0.05	275.83	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	841.66	841.72	0.06	324.47	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	841.72	841.80	0.08	427.59	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	841.80	841.86	0.06	306.86	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	841.86	841.89	0.03	162.50	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	841.89	841.92	0.03	154.55	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	841.92	841.97	0.05	248.98	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	841.97	841.99	0.02	118.85	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	841.99	842.15	0.16	843.28	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	842.15	842.18	0.03	173.53	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.18	842.24	0.06	306.46	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	842.24	842.32	0.07	392.39	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.32	842.39	0.07	385.61	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	842.39	842.44	0.05	288.38	NE151	1691179	2824	Uly silt loam, 11 to 30 percent slopes, eroded
Western Alternative	842.44	842.46	0.02	87.14	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Western Alternative	842.46	842.53	0.07	375.79	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.53	842.59	0.06	306.21	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	842.59	842.62	0.03	171.44	NE151	1691169	7347	Malmo silty clay loam, 6 to 11 percent slopes, eroded
Western Alternative	842.62	842.68	0.06	329.88	NE151	1691156	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.68	842.74	0.05	280.52	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	842.74	842.76	0.03	136.87	NE151	1691156	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.76	842.79	0.03	161.17	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	842.79	842.83	0.04	217.56	NE151	1691156	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	842.83	843.08	0.25	1,319.44	NE151	1691143	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	843.08	843.22	0.14	744.16	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.22	843.26	0.04	207.02	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	843.26	843.37	0.11	555.36	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.37	843.41	0.04	206.63	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	843.41	843.43	0.03	139.23	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.43	843.54	0.11	554.47	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	843.54	843.57	0.03	168.62	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.57	843.62	0.05	254.17	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	843.62	843.65	0.03	136.19	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.65	843.71	0.06	338.59	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	843.71	843.82	0.11	589.91	NE151	1691141	3820	Butler silt loam, 0 to 1 percent slopes
Western Alternative	843.82	843.84	0.02	102.57	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	843.84	844.05	0.21	1,117.26	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	844.05	844.15	0.10	519.82	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	844.15	844.51	0.36	1,879.76	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	844.51	844.56	0.05	276.97	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	844.56	844.63	0.07	360.95	NE151	1691157	3962	Hastings silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	844.63	844.73	0.10	531.44	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Western Alternative	844.73	844.82	0.09	460.20	NE151	1691165	4182	Longford silty clay loam, 7 to 11 percent slopes, eroded
Western Alternative	844.82	845.29	0.47	2,502.71	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	845.29	845.81	0.52	2,746.42	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	845.81	845.97	0.16	861.38	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	845.97	846.01	0.04	210.06	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	846.01	846.14	0.12	645.59	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	846.14	846.19	0.06	301.95	NE151	1691174	3776	Muir silt loam, 1 to 3 percent slopes
Western Alternative	846.19	846.24	0.05	260.09	NE151	2219187	7868	Nodaway silt loam, channeled, occasionally flooded
Western Alternative	846.24	846.27	0.03	176.60	NE151	1691139	7267	Burchard-Steinauer clay loams, 11 to 30 percent slopes
Western Alternative	846.27	846.57	0.30	1,574.86	NE151	1691145	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	846.57	847.25	0.67	3,560.43	NE151	1691144	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	847.25	847.38	0.14	721.43	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	847.38	847.72	0.33	1,753.37	NE095	1691806	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	847.72	847.81	0.09	479.06	NE095	1691767	7231	Judson silt loam, 2 to 6 percent slopes
Western Alternative	847.81	847.83	0.03	136.82	NE095	1691772	7868	Nodaway silt loam, channeled, occasionally flooded
Western Alternative	847.83	847.89	0.06	310.53	NE095	1691768	7153	Kennebec silt loam, rarely flooded
Western Alternative	847.89	848.00	0.11	585.31	NE095	1691767	7231	Judson silt loam, 2 to 6 percent slopes
Western Alternative	848.00	848.33	0.33	1,742.28	NE095	1691806	3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	848.33	848.37	0.04	192.75	NE095	1691767	7231	Judson silt loam, 2 to 6 percent slopes
Western Alternative	848.37	848.42	0.05	260.91	NE095	1691772	7868	Nodaway silt loam, channeled, occasionally flooded
Western Alternative	848.42	848.47	0.05	262.37	NE095	1691771	7750	Nodaway silt loam, occasionally flooded
Western Alternative	848.47	848.63	0.16	849.33	NE095	1691768	7153	Kennebec silt loam, rarely flooded
Western Alternative	848.63	848.77	0.14	759.83	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	848.77	848.83	0.06	294.43	NE095	1691767	7231	Judson silt loam, 2 to 6 percent slopes
Western Alternative	848.83	848.93	0.11	556.15	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	848.93	849.02	0.08	447.60	NE095	1691777	7217	Burchard clay loam, 11 to 30 percent slopes
Western Alternative	849.02	849.07	0.05	285.90	NE095	1691775	7227	Burchard clay loam, 6 to 11 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Western Alternative	849.07	849.14	0.07	358.86	NE095	1691824	7423	Morrill clay loam, 3 to 6 percent slopes
Western Alternative	849.14	849.25	0.11	566.95	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	849.25	849.26	0.01	72.51	NE095	1691824	7423	Morrill clay loam, 3 to 6 percent slopes
Western Alternative	849.26	849.42	0.16	837.61	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	849.42	849.47	0.05	259.75	NE095	1691777	7217	Burchard clay loam, 11 to 30 percent slopes
Western Alternative	849.47	849.53	0.06	333.44	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	849.53	849.63	0.10	520.66	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	849.63	849.66	0.02	127.64	NE095	1691824	7423	Morrill clay loam, 3 to 6 percent slopes
Western Alternative	849.66	849.70	0.04	214.89	NE095	1691827	7417	Morrill clay loam, 11 to 30 percent slopes
Western Alternative	849.70	849.74	0.04	227.39	NE095	1691824	7423	Morrill clay loam, 3 to 6 percent slopes
Western Alternative	849.74	849.80	0.06	307.13	NE095	1691827	7417	Morrill clay loam, 11 to 30 percent slopes
Western Alternative	849.80	849.96	0.16	833.75	NE095	1691824	7423	Morrill clay loam, 3 to 6 percent slopes
Western Alternative	849.96	850.05	0.09	481.45	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.05	850.16	0.11	571.33	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	850.16	850.17	0.02	95.96	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.17	850.21	0.04	197.46	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	850.21	850.25	0.04	196.90	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.25	850.34	0.09	463.34	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	850.34	850.43	0.09	479.35	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.43	850.48	0.05	264.11	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
Western Alternative	850.48	850.56	0.09	464.19	NE095	1691827	7417	Morrill clay loam, 11 to 30 percent slopes
Western Alternative	850.56	850.62	0.05	278.60	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
Western Alternative	850.62	850.67	0.05	262.00	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.67	850.69	0.02	126.01	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
Western Alternative	850.69	850.73	0.04	229.20	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	850.73	850.78	0.04	222.26	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	850.78	850.82	0.05	241.09	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Western Alternative	850.82	850.97	0.14	765.36	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	850.97	850.99	0.03	139.96	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	850.99	851.02	0.03	137.67	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	851.02	851.14	0.12	658.25	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	851.14	851.18	0.04	200.47	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	851.18	851.27	0.09	463.89	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	851.27	851.34	0.07	360.49	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	851.34	851.36	0.02	122.53	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	851.36	851.42	0.05	284.64	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	851.42	851.44	0.03	132.06	NE095	1691783	3820	Butler silt loam, 0 to 1 percent slopes
Western Alternative	851.44	851.53	0.09	481.34	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	851.53	851.57	0.04	187.63	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	851.57	851.69	0.13	669.84	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	851.69	851.73	0.04	184.92	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	851.73	851.80	0.07	356.40	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	851.80	851.84	0.04	212.26	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
Western Alternative	851.84	851.93	0.10	503.36	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	851.93	852.05	0.12	646.27	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	852.05	852.17	0.11	587.97	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	852.17	852.27	0.10	529.86	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	852.27	852.37	0.10	544.95	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	852.37	852.49	0.13	662.27	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	852.49	852.62	0.12	643.25	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	852.62	852.68	0.06	329.46	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	852.68	852.76	0.08	413.97	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	852.76	852.97	0.21	1,108.04	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
Western Alternative	852.97	853.02	0.05	257.34	NE095	1691767	7231	Judson silt loam, 2 to 6 percent slopes

Route ID	From Milepost	To Milepost	Length (mi)	Length (ft)	Soil Series	Mapunit Key	Mapunit Symbol	Mapunit Name
Western Alternative	853.02	853.11	0.10	514.80	NE095	1691772	7868	Nodaway silt loam, channeled, occasionally flooded
Western Alternative	853.11	853.18	0.06	326.84	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	853.18	853.22	0.05	255.88	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	853.22	853.27	0.05	267.06	NE095	1691825	7425	Morrill clay loam, 3 to 6 percent slopes, eroded
Western Alternative	853.27	853.36	0.09	471.57	NE095	1691827	7417	Morrill clay loam, 11 to 30 percent slopes
Western Alternative	853.36	853.42	0.06	304.76	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	853.42	853.50	0.08	403.67	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	853.50	853.67	0.18	934.02	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	853.67	853.78	0.11	574.19	NE095	1691820	7350	Malmo clay, 3 to 11 percent slopes, eroded
Western Alternative	853.78	853.89	0.11	573.00	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	853.89	854.00	0.10	551.57	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	854.00	854.01	0.02	94.12	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	854.01	854.09	0.07	384.83	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
Western Alternative	854.09	854.43	0.34	1,811.40	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	854.43	854.73	0.30	1,594.86	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
Western Alternative	854.73	855.00	0.26	1,396.06	NE095	1691784	3824	Crete silt loam, 0 to 1 percent slopes
Western Alternative	855.00	855.03	0.03	170.99	NE095	1691785	3825	Crete silt loam, 1 to 3 percent slopes
FEIS	855.03	873.29	No Change in FEIS					
RV-1043	873.29	873.45	0.16	847.21	NE095	1691788	3831	Crete silty clay loam, 3 to 7 percent slopes, eroded
RV-1043	873.45	873.49	0.04	190.95	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
RV-1043	873.49	873.53	0.04	209.22	NE095	1691829	4108	Hedville loam, 30 to 50 percent slopes
RV-1043	873.53	873.61	0.08	433.07	NE095	1691818	7666	Mayberry silty clay loam, 3 to 6 percent slopes, eroded
RV-1043	873.61	873.68	0.07	383.46	NE095	1691829	4108	Hedville loam, 30 to 50 percent slopes
RV-1043	873.68	873.84	0.15	817.64	NE095	1691816	4170	Lancaster and Edalgo soils, 11 to 30 percent slopes
RV-1043	873.84	873.94	0.10	511.35	NE095	1691819	7667	Mayberry silty clay loam, 6 to 11 percent slopes
RV-1043	873.94	874.03	0.09	499.06	NE095	1691816	4170	Lancaster and Edalgo soils, 11 to 30 percent slopes
RV-1043	874.03	874.10	0.07	387.04	NE095	1691790	3855	Edalgo silty clay loam, 7 to 11 percent slopes
RV-1043	874.10	874.21	0.11	579.33	NE095	1691829	4108	Hedville loam, 30 to 50 percent slopes
RV-1043	874.21	874.26	0.05	255.55	NE095	1691790	3855	Edalgo silty clay loam, 7 to 11 percent slopes
RV-1043	874.26	874.31	0.05	278.34	NE095	1691829	4108	Hedville loam, 30 to 50 percent slopes
RV-1043	874.31	874.44	0.13	674.63	NE095	1691816	4170	Lancaster and Edalgo soils, 11 to 30 percent slopes
RV-1043	874.44	874.50	0.06	294.54	NE095	1691815	4173	Lancaster loam, 7 to 11 percent slopes
FEIS	874.50	875.38	No Change in FEIS					
			274.425	1,448,965				